110-490

Supreme Court of the United States

No. 44.

THE PENNSYLVANIA RAILROAD CO.

APPELLANT,

vs.

THE LOCOMOTIVE ENGINE SAFETY TRUCK CO.

APPELLEE.

BRIEF OF ARGUMENT FOR APPELLANT.

GEORGE HARDING,
ANDREW McCALLUM,
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For Appellant.

In the Supreme Court of the U. S.

No. 44.

THE PENNSYLVANIA RAILROAD COMPANY,
Appellant.

vs.

THE LOCOMOTIVE ENGINE SAFETY TRUCK CO.,
Appellee.

BRIEF FOR APPELLANT.

Statement of Case.

This is a suit in equity brought in the Circuit Court for the Eastern District of Pennsylvania, by the Locomotive Engine Safety Truck Company, the appellee, against the Pennsylvania Railroad Company, the appellant, for the alleged infringement of Letters Patent of the United States, No. 34,377, granted to Alba F. Smith, Feb. 11th, 1862, for an "Improvement in Trucks for Locomotives."

THE BILL.

(1.) Avers that Alba F. Smith was the true, original, and first inventor of an "Improvement in Trucks for Locomotives."

(2.) That due application having been made he obtained therefor Letters Patent No. 34,377.

(3.) That the title to said patent vested in complainants in 1862 through mesne assignments stated.

(4.) That they have made and sold large numbers of locomotives containing the patented "combination," and have granted licenses under said Letters Patent.

(5.) Sets out the prosecution of a suit for the infringement of said patent in the Southern District of New York, and the decision of His Honor Judge Blatchford in said suit sustaining the patent.

(6.) Avers infringement by the appellants, and instances engines number 627 and 653 as embracing the inventions covered by the Smith patent.

(7.) Prays for an injunction and an account.

THE ANSWER.

(1.) Admits the grant and issue of the Smith patent, No. 34,377.

(2.) Avers want of knowledge as to assignments referred to in the bill.

(3.) Admits the prosecution of the suit in the Southern District of New York, and the determination of the same in favor of the appellee, but avers that the Erie Railroad Company, the defendants in the said suit, had but five of the sort of engines claimed to embody Smith's invention, and that the said defendant company virtually allowed a final decree to be taken against it by consent.

(4.) Avers, upon information and belief, that the invention set out and claimed in the Smith Patent had, with his knowledge and consent, been in public use and on sale for

more than two years prior to his application for a patent therefor.

(5.) Avers prior knowledge and use by a number of persons on railroads named.

(6.) Avers that the invention claimed in the Smith Patent was long before the mention thereof by Smith described in the following Letters Patent of the United States, viz.:

> No. 17,913, granted to Levi Bissell, August 4th, 1857, for "a New and Useful Improved Truck for Locomotives," said patent having been reissued to these appellees on October 18th, 1864, as No. 1,794.
>
> No. ——, granted to Levi Bissell, November 2d, 1858.
>
> No. 2,071, granted to Bridges & Davenport, May 4th, 1841, for an "Improvement in Railway Carriages."
>
> No. 26,562, granted to Kipple & Bullock, December 20th, 1859, for an "Improvement in Car Trucks."

(7.) Denies infringement.

A replication was filed by the appellees and testimony taken on both sides.

It was not disputed that the trucks used by the appellants under a number of their engines were substantially the same as the truck described in the Smith patent; but appellants relied upon the following matters of defence:

First.—Public use for more than two years before Smith's application, the same being with his knowledge and consent.

Second.—Want of novelty; the alleged invention of Smith being shown in the patents to

Bissell, dated 1857; Davenport & Bridges, dated 1841; Kipple & Bullock, dated 1859.

OPINION OF THE COURT.

The case was argued on bill, answer and proofs, before His Honor, Mr. Justice Strong, who decided it in favor of the appellees, stating in his opinion (Record, pp. 126 to 128), that he found the truck described and shown in Smith's patent had been in public use long before his invention, and was also fully shown and described in the patents to Davenport and Bridges, and to Kipple and Bullock; but that their suggestions and the testimony as to the use of such trucks relating solely to railroad *cars* their employment as pilot-trucks for locomotives involved sufficient invention to support Smith's patent.

Having found that this application of the old truck was a patentable combination, His Honor next considered the question as to whether this combination was original with Smith, it being contended by the appellants that substantially the same combination was shown and described in the patent to Bissell, granted in 1857.

This point the Judge terms a "*difficult question, in regard to which his mind has not been free from doubt.*" Reviewing the features of the mechanical construction of the Smith and Bissell truck in view of the state of the art, His Honor finds (R., p. 130), that the one truck is the "*mechanical equivalent*" of the other in its operative parts and in its mode of operation; but he continues by pointing out that the Bissell truck when combined with the locomotive

embraced an additional mechanical feature not possessed by the Smith combination, viz.: The radial bars which confine the motion of the truck to the arc of a circle having a centre outside of the truck itself, while the Smith truck was free to rotate or swivel upon its own centre. The effect of the radial arms of the Bissell truck was to render it, the Judge thinks, "incapable of swiveling on a king-bolt at the centre of the truck or within its frame." And premising this he sums up the points of difference of the two trucks as follows (p. 132):

> "Lateral motion was free to both, but free swiveling around a centre within the frame of the truck was *essential* to one, while the impossibility of it was essential to the other. Practically, therefore, the elements of the two combinations were not the same."

Passing then to the question of abandonment, by the use and sale of this truck for more than two years before Smith's application for a patent, the Court held that while a use in public had been shown for a period exceeding two years before the application, yet it was not such a public use as was contemplated by the Act of Congress, but was a merely experimental use—such as was held in the Nicholson pavement case not to be within the purview of the law.

The Accounting.

Having disposed of the matters alleged in defence as above stated, the Court made the usual decree, referring the case to a Master to take an account of the gains and savings accruing to the defendants by reason of their infringement, and of the damages suffered by the complainants thereby. A large amount of testimony was

taken before the Master and a report filed by him—Record, page 186—in which, after briefly reviewing the testimony taken before him, he finds that the appellants have made *no gains or savings* by reason of their use of Smith Truck, but that the appellees had proved that they had an established license fee under the Smith Patent of one hundred dollars per truck, and that the appellants having in their possession 614 engines embodying the patented combination, the appellees were entitled to damages in the sum of one hundred dollars for each engine, with interest computed from the time when such engines came into the possession of the appellant, which sum he finds to be $89;644. To this report exceptions were taken by both parties—Record, page 156—and the case argued on exceptions before Mr. Justice Strong, who afterwards entered a final decree confirming the Master's report. In passing on the questions raised by exception and argued before him the Court filed another opinion dated June 16th, 1880, which opinion will be found Record, page 589.

Assignment of Errors.

From the final decree in this case the appellants appeal to this Court, submitting that the learned Court erred in view of the evidence:

First.—In finding that the Smith patent was for a combination of a laterally moving truck with a locomotive engine and not for a truck *per se.*

Second.—By holding that there was any patentable invention in view of the state of the art in placing a swinging truck beneath a locomotive engine.

Third.—In finding that the alleged invention of Smith was not anticipated in the patent to Bissell.

Fourth.—In finding that the patentee, Smith, had not abandoned his invention to the public and forfeited his

right to obtain a patent therefor, by its public use for more than two years before his application for a patent therefor.

Fifth.—In finding that the appellees had established a license fee of one hundred dollars for each engine embodying the Smith patent.

Sixth.—In allowing interest on the license fee in the computation of the total amount of damages.

APPELLANT'S POINTS.

I.

There is nothing novel in the construction of the truck shown and described by Smith in his patent. It is

(*a*) Shown and described in the patents to Kipple & Bullock, dated Dec. 20th, 1859, and to Davenport & Bridges, dated May 4th, 1841. (Record, pages 105 to 112).

(*b*) Proved to have been in public and common use long before Smith's invention.

Gleason, p. 96.

Garey, p. 121.

Hitchcock, pp. 122 and 123.

(See opinion of Mr. Justice Strong; Record, pp. 126 to 128.)

II.

Smith's patent should be construed as a patent for the truck described by him *per se*, and not for a combination of this truck with a locomotive. If so construed, it is unquestionably void.

III.

It did not involve patentable invention or novelty, to adapt the well-known swing truck in use under cars to the use of a swing truck under a locomotive. It is secured to the locomotive in exactly the same way in which it was formerly secured to the cars.

Smith's patent, p. 30.

Waters, p. 37.

Hibbard, pp. 91–2.

Harwood vs. *Railway Co.*, 11 H. L. Cas., 654.
Bean vs. *Smallwood*, 2 Story, 408, 410.
Hotchkiss vs. *Greenwood*, 11 Howard, 248.
Brunton vs. *Hawkes*, 4 B. and Ald., 540, 550.
Losh vs. *Hague*, 1 Webster's Pat. Cas., 207.

IV.

The swing truck with divergent swinging links described by Smith, and the swing truck with inclined planes, described in Bissell's patent of August 4th, 1857, are mechanical equivalents, and were well known as such at the date of Smith's alleged invention. See

Smith's patent of Feb. 11th, 1862. (Rec., p. 29.)
Bissell patent of Aug 4th, 1857. (Rec., p. 112.)
Opinion of Court. (Rec., p. 130.)

See Appellant's witnesses:
(Waters, p. 37;)
(Hibbard, p. 93;)
(Waddey, p. 402.)

Appellee's witnesses:
(Heden, p. 161, Q. 4; p. 64–5, Q. 51.)
(Hudson, p. 195, Qs. 63 and 64.)

V.

The patent of Bissell describes and shows two distinct inventions.

First.—The combination of a swing truck with a locomotive (if it be an invention).

Second.—A device for preventing the truck from swivelling round in a direction across the track *in case it should meet an obstruction or be otherwise derailed.*

Bissell's patent, p. 116.

VI.

The combination of the swing truck with the locomotive, and its mode of operation, is in all substantial and material respects the same in the Bissell patent as in that of Smith.

Smith's patent is, therefore, invalid.

VII.

The radial arms described by Bissell were when used so placed that they had no practical influence upon the motion of the truck so long as it remained upon the track. Their function was not exercised until the truck was derailed.

VIII.

Appellees have sustained no damage by reason of the alleged infringement of appellants. If any license fee can be deduced from the evidence, it should be divided by six, to ascertain the amount charged for the use of the Smith patent.

Seymour vs. *McCormick*, 16 Howard, 491.

ARGUMENT.

The Smith Patent.

The Smith patent under which these appellees have brought this suit, as interpreted by the Court below, is for an alleged improvement in locomotive engines, consisting simply in placing beneath the forward part of the engine a *swing-truck*, a device admitted to be in common use at the time under railroad cars. The drawings attached to and forming part of this patent do not illustrate what the appellee's counsel claims, and the Court below decided to be the invention patented, viz.: the "combination" with a locomotive engine of a truck having the capacity of lateral motion, which this truck possesses, but are merely illustrations of an old and well-known form of truck then in general use on the railroads throughout the country.

It is shown equally well in the Davenport & Bridges patent, (Rec., p. 106) and in the Kippler & Bullock patent, (Rec., p. 105.)

And there is undisputed evidence that this truck was in general use under cars long before Smith thought of using it. (See Gleason, p. 96; Buchanan, pp. 18 and 19; Garey, p. 121; Hitchcock, pp. 122–3, Qs. 8 to 15.)

Smith says in his patent, (Rec., p. 30) after stating that laterally moving trucks of some undescribed construction had been in use before his invention:

> "My invention does not relate broadly to such laterally moving truck, but my invention consists in the employment in a locomotive engine of a truck or pilot wheels provided with pendent links to allow of a lateral movement," etc.

And he continues:

> "The mode of applying the same to any ordinary locomotive engine will be apparent to any competent mechanic," etc,

In fact, all that was necessary was to insert the king-bolt under the forward end of the engine into the hole in the top of the truck and the "combination" was complete.

The connection was the same with this truck as with any other, and the same when used with a locomotive as when used under a car.

The specification of the Smith patent as interpreted by the Court below is nothing but a long and complicated way of saying:—

> I place the ordinary swing or laterally moving truck in use under cars beneath the forward end of a locomotive in place of the ridged truck now in use.

If appellee's counsel and the lower court were correct in their reading of the patent, it would greatly gain in perspicuity and clearness by the substitution of this paraphrase for the specification, but

THE PATENT IS REALLY FOR A LOCOMOTIVE TRUCK; NOT FOR THE COMBINATION OF THE TRUCK WITH THE LOCOMOTIVE.

The patent commences by the inventor's assertion that he has—

> "Invented, made and applied to use a certain new and useful *improvement in trucks* for locomotive engines."

Passing then to a description of the drawings forming part of the specification, and which drawings do not represent a locomotive engine, but are simply detailed representations of the old and well-known truck which, as we have said, appellee does not now pretend to have been in any part the invention of Smith. He says :—

> "Figure 1 is a plan of *my truck*."

And then goes on to say :—

> "Several laterally moving trucks have heretofore been made and applied to railroad cars. My invention does not relate broadly to *such* laterally moving truck; but my said invention consists in the employment in a locomotive engine of a truck or pilot wheels provided with pendent links to allow of a lateral movement, etc."

This disclaiming clause certainly does not amount to a statement by the patentee that the truck illustrated in the drawing attached to his patent was one of the well-known forms of "laterally moving trucks," which he acknowledges to have been heretofore in use with cars, and the inference of the reader unquestionably must be that the mechanism which he is illustrating, and by which he proposes to obtain the lateral movement, is in some degree different from the mechanism which he is referring to as old, and this inference is confirmed by the language of the sentence which immediately follows that out of which the above extract is quoted, for he continues :—

> "In the drawing I have represented *my improved truck* ITSELF."

He then goes on to describe at considerable length and with great particularity the construction of this truck

(Record, from line 14 to line 30, of p. 30); and the description of the operation of this truck beneath a locomotive, which immediately follows this description of the truck is (from line 34 to line 50, of p. 30,) a description not of any new functions which the truck performs by reason of being attached to a locomotive, but applies equally well to its operation beneath a railroad car.

Coming to the claim of the patent we find it coupled with another disclaiming clause. The patentee says:—

> "I do not claim laterally moving trucks *nor* pendent links *separately* considered."

Now certainly the conclusion from reading this patent as a whole must be that the patentee did intend to assert a claim to some invention as to the truck itself which he so minutely describes and illustrates, and which he so carefully avoids acknowledging to be an old and well-known device, for if he had intended to disclaim trucks constructed as shown and described by him he would have said simply:—

"I do not claim laterally moving trucks *with* pendent links." Instead of disclaiming the elements contained in the truck he describes, viz.: its lateral motion *and* its pendent links "*separately* considered."

No where in the patent will it be found asserted or admitted, that laterally moving trucks *with* pendent links were not new with the patentee. And a practical man reading the patent could not escape the conclusion, that the patentee had devised a *new truck* of especial fitness for use under a locomotive and that this new truck was what he intended to claim.

We submit that this is the true reading of the specification, and if so there can be no question as to the invalidity of the patent.

And further, we submit that even if the claim could be properly considered as a claim for the combination of a

locomotive with a laterally moving truck, the specification would then be obviously and intentionally calculated and intended to mislead and deceive the public as to the true nature of the invention, and that therefore the patent is invalid. *Evans* vs. *Eaton*, 3 Wheaton, 454.

THERE IS NO PATENTABLE COMBINATION BETWEEN THE SWING TRUCK AND THE LOCOMOTIVE.

There is no pretence that there was or could be any invention in placing the swing truck beneath the locomotive; as we have already shown, and as Smith himself says, any mechanic would know how to do that; there is not a single new part or new form of a part required or suggested as requisite or advisable in either the engine or the truck. When you have said put a swing truck there, you have said all there is to be said. Therefore the patentable novelty of the engine must consist not in invention, but rather in the *discovery* of new and useful properties in a locomotive constructed as indicated, which were not possessed by engines as they were made before. The only novelty claimed for the "combination" lies in the fact that when provided with a swing truck the fore portion of the engine is in certain contingencies enabled to swing away from the centre of the truck, and thereby assumes a position with respect to the track which older forms of locomotives could not do.

When this same truck was used under a car, the car of course had this same capacity for motion, and when running onto a curve for instance, the position taken by the car and by the engine, would be practically the same.

Anybody would know this who knew anything of railroads, and therefore this capacity for lateral motion can not be the *discovery* made by Smith.

It is true that the hind truck of a car is represented in a locomotive by fixed driving wheels, and we may concede

that the position of these drivers on the track would on some curves differ slightly from their position in a fixed centre locomotive; that too is obvious, and every one knew that this difference in position would exist if a swing truck replaced a fixed centre truck. The argument in favor of the patent must then be that Smith was the first to actually experiment with a locomotive with a swing truck, and as a result of his experiments, the first to ascertain that these variations in the position of the drivers were advantageous.

The inventive faculty involved in the bringing together of the locomotive and truck must be conceded to be the smallest possible.

The main reliance of those seeking to maintain that any invention was involved in it must be in the utility of the device—the advantages gained by it, and they will appeal to its large use by the appellants and others as proof of this utility.

But it has been shown that the use of a swing truck with a locomotive is not an improvement on the use of a fixed truck, but on the contrary it is a very serious and harmful mistake, which has cost this appellant many thousands of dollars, (see Master's Report and Mr. Justice Strong's opinion p. 589, where he uses the language following:

> "*There is no gain, profit, or advantage in the use of one over the use of the other.*")

Mr. Parry, one of the partners in the Baldwin Locomotive Works, (perhaps the largest builders in the world) sums up the whole matter very briefly on page 422.

> "+Q. 25.—A. * * *I at one time thought it, (the swing truck) was an improvement like most other people.* "*Run in fashions, run in ruts*" *they say.*
>
> +Q. 26. *When was it changed?*

A. *It was changed a good many years ago. I have always regarded it as a means of helping to remedy a wrong by making another wrong; that is, one wrong to help another wrong to get it nearer right.*

+Q. 27. DO YOU CONSIDER IT AN IMPROVEMENT OR NOT?

A. NOT AT ALL.

+Q. 28. AN ENGINE EQUIPPED WITH A SWING-BOLSTER TRUCK IS LESS PERFECT AS A MACHINE THAN ONE WITHOUT A SWING-BOLSTER TRUCK?

A. I THINK SO."

An overwhelming preponderance of the witnesses examined agree with Mr. Parry in their estimate of the utility of the swing truck, and the opinion is made a certainty by the experiments tried and exhibits put in evidence. This subject is, however, so thoroughly dealt with by the Master in his report, which contains references to the testimony, that it is unnecessary to go more into details here.

As Mr. Parry says, the swing truck was for awhile "the fashion," but, like many other fashions, it has no good reason for its existence, and the device was entirely without that superior practical utility which, in many cases, has been held to supplement and eke out an apparent want of invention.

It is, as your Honors know, the custom of the drivers of street-cars to drive their horses to the inside of a curve in turning a corner, and so aid in pulling the car around the curve; the fixed centre truck pulls the engine around in the same way. Mr. Smith (if it was Mr. Smith that first suggested the swing truck) said, No! drive your horses to the outside of the curve;—for that is the same as putting a swing truck on a locomotive, as everybody knew without being told. Now it is a mistake to follow this suggestion, and not the less so that some drivers of street

cars or builders of locomotives may have been misled into doing so.

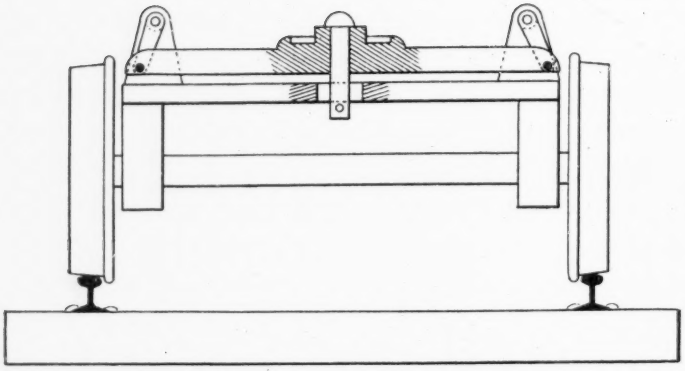
Therefore there is in this case no utility to eke out an obvious poverty of invention.

There is in the Smith patent some hints as to a very ingenious *theory* as to the operation of the swing truck under a locomotive, which hints are developed into a full-fledged theoretical argument, or argumentative theory in the testimony of the appellees' witness, Mr. Renwick, whose views are accepted and dwelt upon by the lower Court in its opinion.

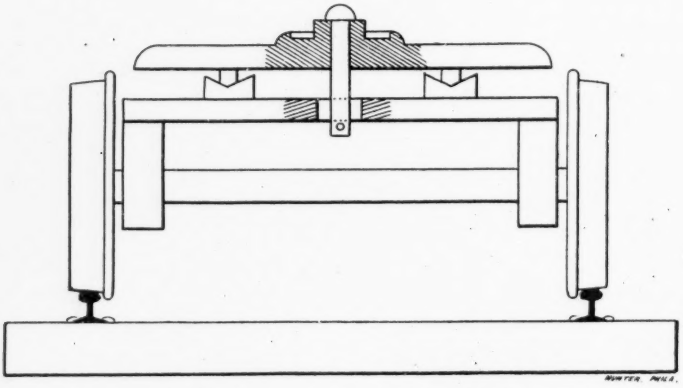
In this theory there is undoubtedly invention, but invention of a kind for which Congress provides protection under the copyright laws and not under the acts relating to patents. And, besides, since the trucks as used by the appellants and others, did not behave in anywise according to the *theory*, we cannot be held to have infringed it.

Besides this theory is much more fully and logically described by Bissell in his 1857 patent than it is by Smith in 1862, and your Honors will recognize on reading Mr. Bissell's patent that Mr. Renwick obtained not only the points but the whole of his argument not from Smith but from Bissell.

If, however, the Court shall be of the opinion that the Smith patent should be construed, as contended by appellees, to cover, not the truck we have demonstrated to be old, but the new (?) combination of such a truck or an equivalent device with a locomotive, and shall be further of the opinion that the use of a laterally moving truck with a locomotive, if new, involves invention enough to support a patent, it will become necessary to examine into the state of the art to ascertain how far, if at all, this combination possessed patentable novelty when devised by Smith. We have shown beyond the possibility of dispute that *Smith*



KEPPLE & BULLOCK. In use since 1852



BISSELL In use before 1857

can claim no invention in either the truck, the body of the locomotive, or the means of uniting or combining them together. But besides the Kipple & Bullock and the Davenport & Bridges trucks there was another truck described in a patent of 1857, and in use prior to Smith's invention, which was the exact and well-known mechanical equivalent of the swinging-link truck, viz.:

The Bissell Truck.

THE MECHANICAL EQUIVALENT OF THE TRUCK DESCRIBED BY SMITH.

This truck is shown and described in the patent to Bissell (printed Record, pp. 112 to 120), but he does not claim to be the inventor of it, and indeed expressly disclaims it as applied to cars (bottom of page 115).

The truck is intended and calculated to perform the same functions as what for convenience we may call the Kipple & Bullock truck, and the two trucks are identical in the number and arrangement of their parts. The only difference being that the links of the Kipple & Bullock truck are represented in the Bissell truck by inclined planes.

The elements of each truck are as follows:—

Bissell.	*Kipple & Bullock.*
1. Ridged truck frame with	1. Ridged truck frame with,
2. laterally moving bolster, resting on	2. laterally moving bolster, resting on
3. inclined planes.	3. swinging links.

The function performed by the swinging links in the one case, and the inclined planes in the other, is the opposing to a force tending to move the truck laterally beneath the car or engine of a portion of the weight of the body resting on the truck, which portion is regulated by the angle of inclination given to the links or to the planes; that is, the

trucks can only move laterally by raising the mass of the car or engine which rests on the swinging bolster.

The testimony establishes the fact that the divergent links were in common use as early as 1852 (Hitchcock p. 122; see also Gleason, pp. 95 and 96); and as we have stated, Bissell, in 1857, acknowledges the inclined planes to be old; there can be no question, therefore, but that at the time Smith took up the subject these two trucks were well-known mechanical equivalents, and that a skilled car builder would recognize the one as interchangeable for the other. If required (for instance) to provide a car with laterally moving trucks the builder would be as likely to use one as the other.

The equivalency (and for the purpose of this case), the identity of the two trucks may be seen at a glance, and it is fully recognized by His Honor Justice Strong in his opinion (p. 130), where he says:

> "*I think the sliding beam, the blocks and the inclined planes may well be regarded as mechanical equivalents for the swinging bolster and the pendent links; certainly when the links are made to diverge.*"

That the Court was not only legally but mechanically correct as to the equivalency of these devices is shown by the testimony of appellee's own witness, Heden (page 163), who testifies that on the New Jersey road of which he was superintendent both trucks were in use at the same time, one builder providing his engines with the swinging links, and the other his with the inclined planes:

> "+Q. 26. * * * I want you to describe the kind of swing truck that you used on your road, and we can tell what it is after you have described it.
>
> A. Do you mean the particulars in detail?

+Q. 27. Yes; that is just what I mean.

A. Well, if you had the drawings I could point it out. There was a centre-pin, and a cup, and a ring of rubber, and a wrought-iron plate and inclined plane.

+Q. 28. It had the inclined plane, had it not?

A. Yes.

+Q. 29. Had it the pendent links?

A. Not all.

+Q. 30. What do you mean by that "not all?"

A. Not all the engines used had the pendent links.

+Q. 31. *Now, as I understand you, there were two kinds of swinging trucks used on your road, one that had the pendent links and one that had the inclined plane; am I right?*

A. *Yes; the engines built by the Baldwin Locomotive Company had the pendent links, and those built by the Danforth Locomotive Works had pendent links; but the Rogers locomotive had not; it had the inclined plane.*"

Two Distinct Inventions are Described and Claimed in the Bissell Patent.

Bissell's claims are as follows, pp. 115 & 116:

First.

"Attaching trucks, having four or more wheels, to locomotive engines, in the manner substantially as specified, so that the said truck is allowed a lateral motion under the engine and moves upon a centre located between the drivers and the centre of the truck, in such a manner that the relative positions of the four or more truck wheels with the driving wheels, as determined by the straight or curved track, shall cause the body of the engine to assume the correct position relatively with said track substantially as specified."

Second.

"The inclined planes *o* or *q*, and blocks *n n* or *p*, *or their equivalents*, in combination with a truck of four or more wheels, having a lateral motion under the locomotive engine, the whole constructed and acting substantially as and for the purpose specified."

BISSELL'S SECOND CLAIM IS FOR THE IDENTICAL COMBINATION NOW CLAIMED AS SMITH'S INVENTION.

This second claim clearly covers the identical mechanism claimed by Smith, if his claim is construed to be for a combination and not for a truck. The word "*equivalents*," in the claim could only relate to the swinging-link truck (so far as the record shows the only equivalent for the inclined planes then known), and the patentee evidently intended to cover by this claim just what appellees contend is covered by the Smith patent, to wit: *the combination of a locomotive engine with a laterally moving truck.*

1857	1862
BISSELL'S CLAIM.	SMITH'S CLAIM.
"I also claim the inclined planes o or q, and blocks *n n* or *p*, *or their equivalents*, in combination with a truck of four or more wheels, *having a lateral motion under the locomotive engine*, the whole constructed and acting substantially as and for the purpose specified."	"What I claim and desire to secure by letters patent is the employment in a locomotive engine of a truck or pilot wheels, fitted with the pendent links *o o*, *to allow of lateral motion to the engine* as specified, whereby the drivers of said engine are allowed to remain correctly on the track in consequence of the *lateral motion of the truck* allowed for by said pendent links when running on a curve as set forth."

The fact that Bissell in his first claim seeks to cover the additional element of *radial bars* in combination with the laterally moving truck and the locomotive renders it certain, we submit, that he did not intend to include the radial bars in the second claim, as the two claims of his patent would then be in substance identical.

APPELLEE, HAVING ASSERTED ITS OWNERSHIP IN THIS COMBINATION UNDER BISSELL'S PATENT, SHOULD BE ESTOPPED FROM CLAIMING IT UNDER SMITH'S PATENT.

That Bissell was entitled to the credit for this combination of the locomotive with the laterally moving truck, and that his patent was intended to and did cover and secure to him *this* combination, as well as the other combination with these elements of the *radial bars*, has been fully recognized by these appellees who acquired the ownership of the Bissell patent in 1862, long prior to the beginning of this suit and reissued it in 1864 (Record, page 116,) with the following claim (page 118):

> "*First.*—Connecting the truck with the frame of the locomotive so that it shall be free to move laterally with the frame, in combination with the means herein described, *or the equivalent thereof*, by which the weight of the locomotive resting on the truck aids automatically to resist the lateral motion of the truck and retain it in a central position while running on the straight parts of the track, and to aid in restoring it to such position when passing from curved to straight parts of the track, substantially as set forth."

At the time that the appellees obtained this re-issue, they had been for two years the owner of the Smith patent, (see bill, p. 2,) which did not expire until eight years after the expiration of the Bissell patent, and, yet, instead of disclaiming, they reassert this claim of Bissell to be the

inventor of the swing truck locomotive in even more positive and exact language than he asserted his right in the original patent.

It is with an ill grace then that these appellees after asserting this claim until the expiration of the Bissell patent in 1871,—(For they sued the Erie Railroad Company under it in 1870. Rec., p. 32,)—Now come forward and under this bill filed in 1872, assert that the Bissell patent not only did not cover this combination but that the invention itself is not to be found in it and was not disclosed to the public until Smith obtained his patent in 1862.

We submit that these appellees in seeking the aid of a Court of Equity to assert their ownership in this invention under the Smith patent, do not come with *clean hands*; having with full knowledge of the facts asserted this ownership to be in it by reason of the Bissell patent, reissued by it in 1864, and continued to assert *this* title until it lapsed, and then for the first time asserted that they really held this monopoly, not under the distinct and reiterated claim of the Bissell original and reissue, but under the involved and obscure claim of the Smith patent.

But aside from the gross injustice of this claim under the circumstances, we submit that,—

THE INVENTION NOW CLAIMED FOR SMITH IS NOT ONLY CLAIMED, BUT FULLY DESCRIBED AND DISTINGUISHED IN THE SPECIFICATION OF BISSELL,

Because

First.—The trucks are the same; that is, the truck with links is the equivalent to the truck with the inclined planes.

Second.—Both Smith and Bissell connect the truck with the engine in the same way and in the same place, viz.: by passing the king bolt through the swinging or sliding bolster.

Third.—Both Bissell and Smith describe the result or effect of this combination in the same way.

(*a*). As resulting in steadying the motion of the engine on a straight track.

BISSELL.

"If the curve block *k* and bars *i* alone were made use of there would be a vibration of the engine on the truck when running on a straight line, and a tendency to move too far by the centrifugal force when entering a curve. I, therefore, obviate this difficulty by providing two inclined planes *o o*. Figs. 5, 6, formed double, as shown, and of an angle proportioned to the weight of the forward part of the locomotive and the velocity of the same, and fit blocks *n n* on the cross-bar *n* surrounding the centre pin. The position of the inclines is such that the blocks *n n* rest in the lowest part of the double inclines when the engine is on a straight track, * * * * * * * * * * * and on coming on to a straight line the blocks *n* descend to the bottom of the incline, and the engine is prevented from acquiring a sideways or oscillating motion."

SMITH.

"When running upon a straight road the engine preserves great steadiness, because any change of position transversely of the track, in consequence of the engine moving over the truck, or the truck beneath the engine, is checked by the weight of the engine hanging upon the links *o o*, and in consequence of their divergence any side movement causes the links on the side towards which the movement occurs to assume a more inclined position, while the other links come vertical or nearly so; hence the weight of engine acts with a leverage upon the most inclined links to bring them into the same angle as the others, greatly promoting the steadiness of the engine in running in a straight line. * * * * * * Upon entering a straight track the truck assumes the central position, and in case of irregularity in the track or any obstruction the truck moves laterally, without disturbing the movement of the engine."

(*b*). As enabling the driving wheels of an engine while on a curve to travel in a direction parallel to a tangent to the curve while the axles of the truck wheels are parallel to the radius of the curve passing through the centre of the truck.

BISSELL.

I therefore construct my truck in such a manner that the axles of the driving wheels shall be on the line of, or parallel to, the radial line of the curve, so as alway to have a direct forward propelling motion, and not strain or wear the rail or flanges of the wheels, and so that two or more pairs of drivers can be fitted with flanges; consequently the centre line of the locomotive, in going around the curve, travels as a tangent to the centre of the drivers; and to accommodate the curve, I fit the truck or forward wheels in such a manner as to allow of a transverse motion, *the said truck swinging laterally upon an axis of motion h, located centrally between the centre of the drivers and truck (or slightly forward of the same, so as to give a slight*

SMITH.

As the pilot or truck wheels enter a curve a sidewise movement is given to the truck in consequence of the engine and drivers continuing to travel as a tangent to the curve of the track. This movement and the slight turn of the whole truck on the king bolt *i*, not only causes the truck wheels to travel correctly on the track with their axles parallel to the radial line of the curve of track, but also elevates the outer side of the engine, preventing any tendency to run off the track upon the outer side of the curve.

tendency to the truck to run the inner side of the curved track) ; thereby the axle of the truck wheels are parallel (or nearly so) to the radial line of the curved rail, and the engine runs around any given curve without much more strain either on the wheels or the track than would occur on a straight railroad. * *

The outer rails on curves always have to be more or less elevated to overcome the centrifugal force, and the tendency before mentioned to run off, as shown in Figs. 1 and 2 ; but inasmuch as this tendency is obviated in my engine, the outer rails need not be so much elevated.

The above extracts; omitting that portion of the extract from Bissell's specification printed in italics; comprise the whole description contained in each patent of the effect of the combination of the locomotive with the laterally moving truck, and Your Honors cannot fail to be struck with the fact that the two descriptions are substantially identical.

And if the claim of the Smith patent *can* be construed to cover the combination described, we submit, that in view of the identity of the descriptions the second claim of Bissell cannot fail to be so construed.

Bissell's Radial Bars.

Bissell not only has two claims in his patent, but also two distinct inventions—he not only invented the combination of the laterally moving truck with the locomotive, but he also devised a further improvement adapted to be used with this combination, and the description of this invention forms by far the largest part of his specification and is the subject of his first claim.

In the beginning of his specification he states:—

> "The object of my invention being TO RETAIN THE TRUCK WITH THE AXLES ALWAYS AT RIGHT ANGLES TO THE RAIL WHETHER ON A STRAIGHT OR CURVED TRACK,
>
> and
>
> PREVENT THE TRUCK SWINGING AROUND ON ITS CENTRE PIN IN CASE OF MEETING WITH ANY OBSTRUCTION."

The first of these "objects" is purely the result and function of the laterally moving truck.

The second of these "objects," he accomplishes by means of his "radial bars."

Speaking of engines as they were constructed with "fixed centre trucks," he points out (p. 113) what he considers its defects, viz.: *first*, its tendency to wedge the engine across the track and force the truck against the outer rail; *second*, the liability of the truck *when derailed* from any cause to swing around crosswise on its centre and thus throw the drivers from the rails and causes the wreck of the train.

The first of these defects of the fixed centre truck, which is more a matter of theory than of practical importance, he obviated by the use of a laterally moving truck, which as we will show simply replaced this defect by another.

The second defect, which is a very real danger, he overcame by means of the radial bars, which have no real effect upon the motion of the truck under the engine so long as it remains *on the track* but in case of its leaving

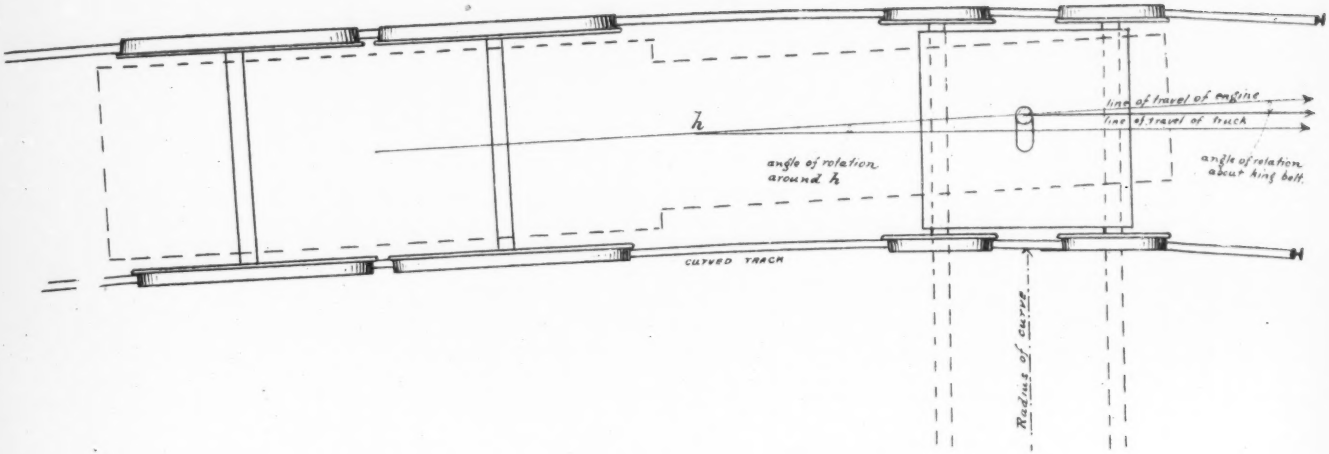
the track comes at once into operation and keeps the truck from swiveling around crosswise to the engine; a danger just as real where a laterally moving truck is used as it is with one having a fixed centre.

Mr. Bissell after having overcome the first difficulty by the use of the laterally moving truck, carefully examined the nature of its movements with respect to the engine and found that it had two which always took place simultaneously, to-wit: a *slight* turn on the king bolt and a *slight* sideways or lateral movement; that is, the movement of the truck under the engine was, he found, made up of the result of two slight elementary or component movements, and this *resultant* movement, he found to be substantially, identical with a single *slight* movement of the whole truck around a centre situated outside of the truck itself and about midway between the centres of the drivers and the truck.

Having ascertained this fact he utilized his knowledge in a beautifully simple and practical way by fastening the swing truck by means of metal bars or arms to a point on the bottom of the engine, which substantially coincided with the point found to be the centre of the resultant motion made up of the two motions of the truck. When thus secured the truck was still enabled to move laterally when on a curve, and to turn through the slight angle necessary on its king bolt, but it could no longer turn on its king bolt without moving laterally at the same time, and its lateral motion was confined within limits practically very small, though abundantly ample to allow the truck to accommodate itself to any railroad curve.

Returning to the patent (p. 113), and re-reading the extract relating to the functions of the laterally moving truck, together with the following description of the functions of the radial bars, we find the following:—that portion printed in Roman type relating, as we have already

SKETCH Nº 1


h
angle of rotation around h
line of travel of engine
line of travel of truck
angle of rotation about king bolt
CURVED TRACK
Radius of curve

pointed out (p. 26), to the laterally moving truck *per se*, and that in italics to the effect of the radial bars.

> "I therefore construct MY TRUCK (the specification says) in such a manner that the axles of the driving wheels shall be on the line of or parallel to the radial line of the curve, so as always to have a direct forward propelling motion, and not strain or wear the the rail or flanges of the wheels, and so that two or more pairs of drivers can be fitted with flanges; consequently, the centre line of the locomotive, in going around the curve, travels as a tangent to the centre of the drivers; and, to accommodate the curve, I fit the truck or forward wheels in such a manner as to allow of a transverse motion, *the said truck swinging laterally upon an axis of motion h located centrally between the drivers and truck, (or slightly, forward of the same, so as to give a slight tendency to the truck to run to the inner side of the curved track;)* * thereby the axles of the truck's wheels are parallel (or nearly so) to the radial line of the curved rail, (see sketch No. 1,) and the engine runs around any given curve without much more strain either on the wheels or the track than would occur on a straight railroad, *and* AT THE SAME TIME *there is no chance for the truck to turn on its centre pin* BY ANY OBSTRUCTION COMING IN CONTACT WITH THE WHEELS, (see sketch No. 2, A & B) *and the wheels will pass over a broken rail and not be displaced unless all four wheels are simultaneously unsupported, and even then the wheels and truck, being set correctly to the angular position with the driver, and the curviture of the track will*

* Or in other words, the point "h" is so situated that it does not *interfere* with the lateral motion and slight turn of the truck on its being run on a curve, for the curvature of the rail is the only "means of turning the truck" (see bottom of p. 113), while "at the same time," the truck is prevented from assuming any of the improper positions which the patent goes on to describe.

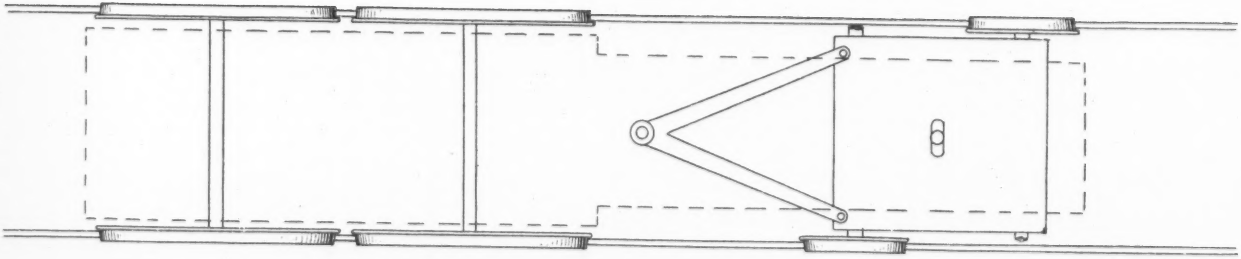
continue to move in the correct direction, and pass over any obstacle or broken rail and attain the uninjured part of the track. And in running on a straight track the truck is held correctly in position, and will run over quite considerable obstruction without being turned aside.

In running on either a straight or curved track, one of the truck wheels often breaks off, and the truck swivels around on its centre pin in consequence, and throws the engine off the track; but with my device, one wheel, or even the two wheels on the opposite sides diagonally of the truck might break off, and still the truck would not run off, because its position is set, and it has no axis of motion around which it could swing WHEN INJURED, *as above noted,* (see sketch No. 3) *or when meeting a broken rail or* ANY OBSTRUCTION, *but is given a direct forward propulsion. And in all cases the axles of my wheels have only a strain and tortion due to the difference of length between the outer and inner rails, instead of a strain due to the binding of the flanches of the wheels from the diagonal position of the axles* (see sketch No. 4) *in addition to the above-named strain; hence axles so often break when running around a curve. With my engine the friction on the rails in running around curves is avoided, and I am enabled to maintain a nearly uniform speed without any unusual strain or wear on any parts.*"

It is perfectly clear from the above description, that while a laterally moving truck was essential to the use of the radial bars, these radial bars were not necessary to the use of laterally moving trucks, which trucks however, if used *alone*, were open to the same dangerous tendencies as the old fixed centre trucks, in that they were free to swivel *crosswise* to the truck if derailed, and had the same tendency to wedge themselves across the track.

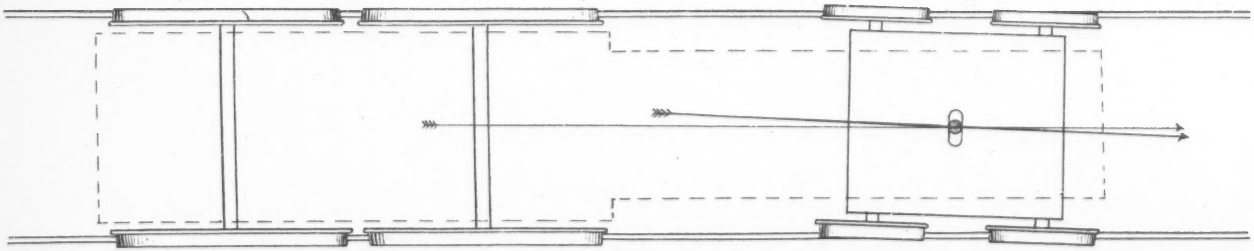
While Bissell did, as we have endeavored to point out, distinguish his *two* inventions in the specification of his

SKETCH Nº 3



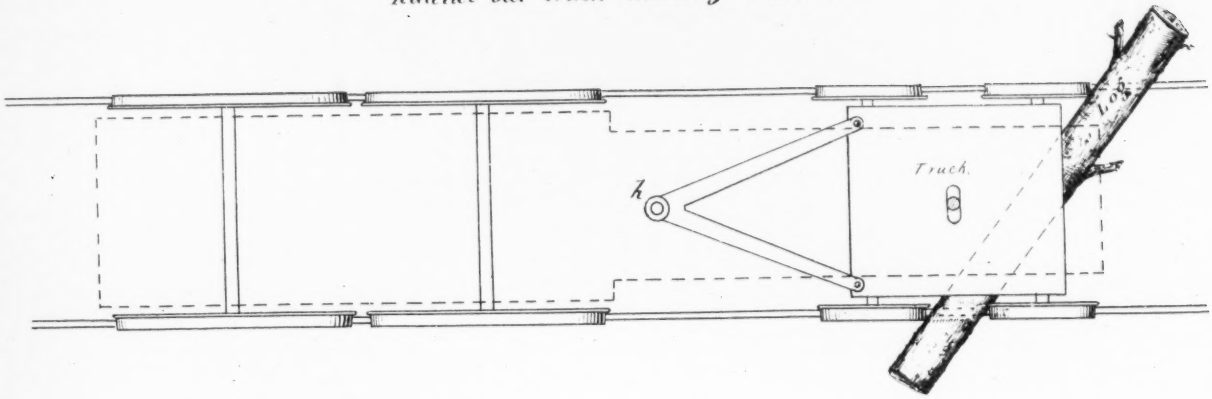
SKETCH No. 4

Showing wedging of free swiveling truck on track.



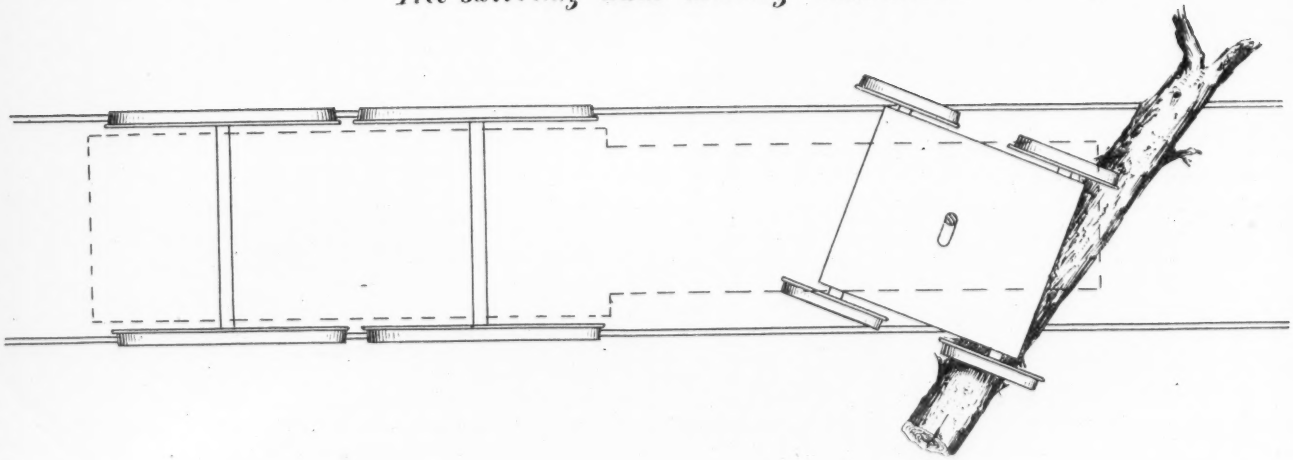
SKETCH Nº 2. A.

Radial bar truck meeting obstruction.



SKETCH Nº 2, B.

Free swiveling truck meeting obstruction.



patent, and claim them *separately;* he yet, no doubt, felt convinced that the combination, including the radial bars was of much more value than the mere combination of the laterally moving truck with the locomotive, and expected that the radial bars would be almost always if not invariably used, and he was quite correct in this conviction, for while laterally moving trucks of all kinds have, after a season of popularity, been found simply to replace the difficulty they are intended to avoid by another quite as serious, and consequently are going out of use (this appellant for instance having ceased to use them), the radial bars or equivalent devices for confining and limiting the swivelling tendency of trucks are now in use on all engines and cars.

The radius bars were used with the swinging link truck as early as 1862.

APPELLEE'S WITNESS, BUCHANON, P. 17.

+Q. 34. Was this Bissell engine used at all on your road.?

A. We did not use the Bissell arrangement.

+Q. 35. Was it ever used upon that road to your knowledge?

A. Nothing more than a radius bar. *I put a radius bar on some few engines in connection with a swinging bolster.*

+Q. 36. When did you do this?

A. It must have been about 1862 or 1863.

The radial bars were thought by railroad men a more valuable device than the lateral moving truck without them.

APPELLEE'S WITNESS, HEDEN, PP. 163 & 165.

+Q. 34. When you say that your estimate was one hundred dollars, you refer to those trucks that had the inclined plane, either with or without the radial bars. Is that so?

A. Yes, sir: but *more particularly those with the radial bars. That I estimate is a very important improvement.*

"+Q. 51. Do you know the proportion of swinging trucks in use on your road which had this radial bar or inclined plane, and what proportion had these pendent links?

A. No; I could not tell exactly, but I think there are *twice the number with the radial bar that there are with the pendent links. The radial bars were the first.* There may be a little more. *There may be nearly three times as many with the radial bar as with the pendent links.* There are twice as many, at all events."

Bissell is recognized by appellees principal witness as the inventor and introducer of the "swing truck."

HUDSON, p. 195.

+Q. 63. *When did your experience commence with swing trucks as against fixed trucks applied to locomotive engines?*

A. *I am not able to fix the date, but soon after Bissell's patent was taken we commenced to use it.*

The laterally moving truck with inclined planes was used without radial bars as well as the inclined link truck.

HEDEN, p. 163.

+Q. 32. Were the radial bars connected with the inclined plane?

A. Yes; *some were.*

It is a matter of common knowledge that every car and engine truck is to-day provided with means for preventing the swiveling around of the truck in case of meeting obstructions or becoming otherwise derailed; usually this is done by attaching short iron chains to the ends of the truck, and the bottom of the car having the chains loose enough to permit the truck to swivel within proper limits, but prevent it from turning dangerously far.

These chains are but a modification of Bissell's radial bar, and are intended to and do perform just the same function in substantially the same way.

SO LONG AS THE ENGINE REMAINS ON THE TRACK THE RADIAL BARS ARE PRACTICALLY INOPERATIVE.

If we have succeeded in showing that Bissell in his patent fully described and claimed not only the combination of

A LOCOMOTIVE,—A LATERALLY MOVING TRUCK,—AND RADIAL BARS,

but also the distinct combination of

A LOCOMOTIVE,—AND A LATERALLY MOVING TRUCK,

it will not be necessary to consider whether the lower Court was in error in holding that the combination of the three elements did not anticipate the combination of two elements, for the Court does not seem to have examined into the question as to what was the subject matter of Bissel's second claim, but to have taken it for granted that there was but a single invention disclosed in the patent. Even were it true, however, that Bissell did not contemplate the use of a laterally moving truck without radial bars, we submit that the invention attributed to Smith must still be found to have been anticipated by Bissell, inasmuch as the radial bars were not only intended to be, but were, practically inoperative so long as the truck remained on the track and met with no obstruction. Mr. Justice Strong, in approaching this subject, uses the following language in his opinion (page 129):

> I come next to what appears to me the most important and *difficult question* in the case IN REGARD TO WHICH MY MIND HAS NOT BEEN FREE FROM DOUBT.

Again in speaking of the Bissell patent his Honor says:

> "The invention as described by the patentee was

> in substance a combination with a locomotive engine of a pilot truck framed to allow lateral motion."

And he continues by pointing out that the truck described by Bissell was the mere mechanical equivalent of the truck subsequently described by Smith (page 130).

Then, acting as we have stated, on the assumption that Bissell did not conceive of the use of the laterally moving truck with a locomotive unaccompanied by the radial bars, and that his patent would not suggest to one skilled in the art that the truck could be used without the bars, his Honor proceeds to carefully compare the capacity of movement possessed by the unconfined truck and the truck with the radial arms (pages 130 to 133), coming to the conclusion that it was of the essence of Smith's invention that the truck should be "free" to swivel on its king bolt, and further concluding that the truck, when secured to a centre outside of itself by radial arms, could not turn or swivel on the king bolt at all; for instance, referring to the Bissell truck provided with radial arms, he says (page 132),

> "* * * it seems to me that rotation of the truck around any bolt or point at its own centre or within its frame was rendered impossible. The truck in its entirety had a centre of rotation at the point (h), and that there can be but one centre of rotation to one body is confessedly true."

Hence the Court concluded that there was *necessarily* a difference in the mode of operation of the two devices, and that different results were obtained by their respective use.

The Court was entirely right in saying that the truck without radial bars was "*free*" to swivel on the king bolt, and that the truck with these bars had not this freedom, but was demonstratably in error in finding that the radial bars prevented any rotation or swiveling of the truck about the pin.

The *freedom* of rotation possessed by the truck without

bars cannot, however, be claimed as an element of its operative functions since, as we have already pointed out, and as Bissell so fully explains in his patent, it is this very *freedom* to swivel, not only in proper but in improper, directions, which is the great difficulty with both fixed centre trucks and laterally moving ones as well, if unprovided with radial bars.

If the truck secured only by the king pin leaves the track, it is *free* to swivel around crosswise to the engine, while the truck with the radial bars must still remain in the right direction; but under these circumstances the first truck is no longer "in combination" with anything, in fact there is, from the instant it exercises its freedom to swivel, neither engine nor truck, nothing but a wreck, while the restrictions imposed on this swiveling *freedom* by the bars saves the engine.

It cannot be, therefore, that the restriction on the freedom of the truck to swivel on the king bolt *when off the track* makes the combination of the truck with bars and the locomotive a different operative combination from that formed with the locomotive by the truck without bars. The question as to the relative capacity for movement and operative parts of the two trucks must be confined without doubt to the practical exigencies of railroad use, and the operations of each truck examined as it takes place *on the track*. We think that it will be found that the learned Court below has fallen into error from not having had brought to its attention this practical limitation on the motions of the truck with respect to the engine, and hence made the mistake of considering the movements of the engine as taking place on geometrical lines and curves instead of on a railroad track. But before examining into the practical movements of an engine on its track, there is one mathematical mistake in the opinion of the Court which, as it is made in great part the basis of the conclusion arrived at, it is necessary to correct.

The learned Court, in the passage above quoted from his opinion (p. 133), states that any "rotation" of the truck with bars around the king bolt is, in his opinion, "impossible," because, the truck having a centre of rotation at the point (*h*), (see Bissell's drawing, fig 5, following p. 116,) cannot rotate about any other point.

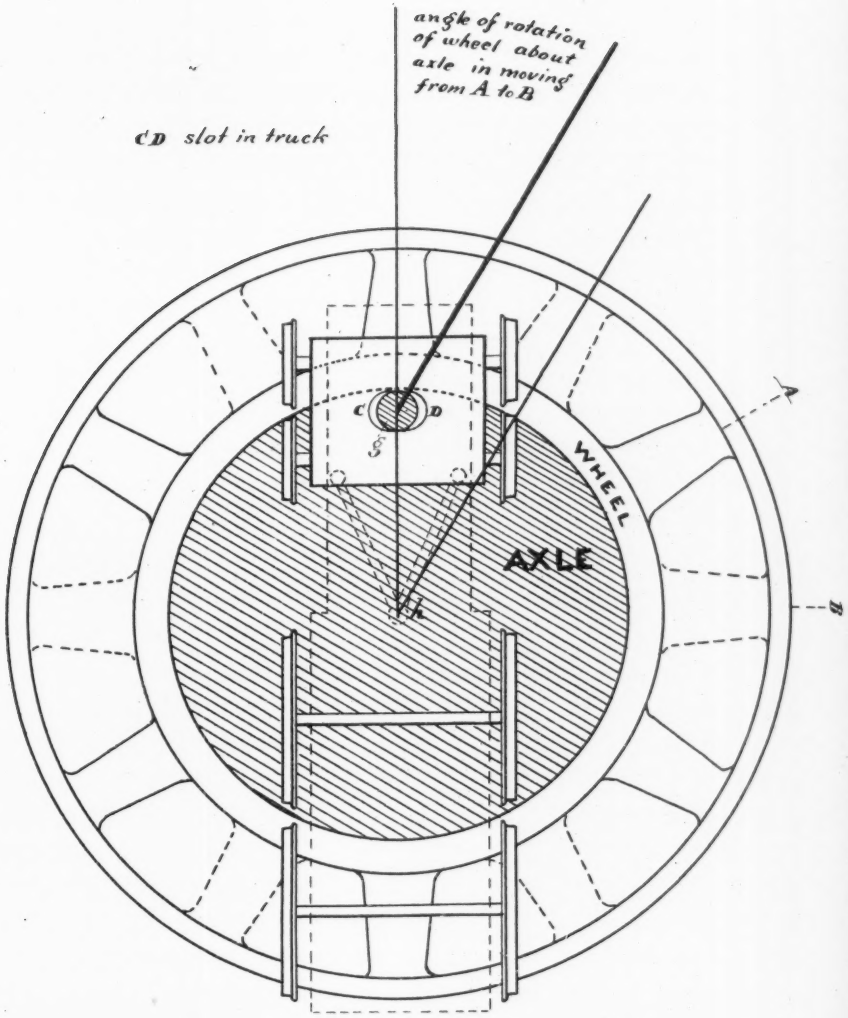
Now while it is true that the "centre of rotation" is at the point (*h*) it is not true that the truck can have no motion of rotation about any other point. For instance, a wheel rotates on its axle, but the centre of the rotation is not the axle, but a mathematical or imaginary POINT in the centre of the axle, yet the wheel is really turning not only about this mathematical centre, but about every other point in the axle, and not only so, but it is also for each angle of revolution about the centre, turning or revolving to an exactly equal angle about every other point in the axle.

What is true of the wheel is equally true of the truck with radial arms. The king bolt being like the point (*h*) fixed to the bottom of the locomotive, is really a point in the axle about which the truck revolves, hence in turning about the point in the middle of the pin (*h*), which is the centre of revolution it also turns or revolves to an exactly equal degree around the king bolt which is on the outside of the circumference of the axle. (See illustrative sketch.)

Mr. Bissell in the part of his specification which is quoted by the Court as confirming its opinion that the truck with bars did not, and could not, have any motion of revolution about the king bolt, says:

> "g is the centre pin, which in my arrangement changes its character from a CENTRE *of motion simply* to that of a draft block or pin, which the centre of motion is thrown back to the point (*h*)."

Mr. Bissell was describing the truck which he claims in his first claim, and pointing out the distinction between it and *the fixed centre truck*, where the centre of the king pin *is* the centre of its motion with respect to the engine,


angle of rotation of wheel about axle in moving from A to B
CD slot in truck
C
D
WHEEL
AXLE
A
B

but if he had been describing the laterally moving truck without bars, or if the above quoted passage were interjected into Smith's own patent, it would be equally correct. The king pin looses its character as the *centre of motion*, not by reason of the radial bars but because of the lateral motion allowed to the truck. As soon as you replace the fixed by the movable bolster the centre of the motion of the truck is no longer in the king bolt, for it is the essential idea of this device and the unvarying law of its operation that every turn it makes should be accompanied by a simultaneous sidewise movement. The bolt is still of course the draft pin, but the centre of the arc through which the truck moves must be sought at some point back of the truck and Mr. Bissell found that for all practical purposes it coincided with the central point between the middle of the drivers and the middle of the truck, or a point slightly forward of that centre, and at this point he directs that the radial bars shall be attached to the engine for the reason that so centred they would not interfere with the motion of the truck so long as it remained correctly on the track.

In the beginning of his specification Bissell says:

> "The object of my invention being *to retain the truck with the axles always at right angles to the rail whether on a straight or curved track*,
>
> and prevent the truck swinging around on its centre pin in case of meeting with any obstruction,
>
> *and to make the curvature of the rail the means of turning the truck so that the axles are parallel to the radial line of the given curve.*"

Now it is perfectly clear from this statement not only that Bissell did not intend the radial bars to come into active operation so long as there was no "obstruction" on the track, but also that he did intend that the truck should assume the same position on a curve as the Smith truck, and that the track itself should be "*the means*" of guiding

the truck into the proper position. If the track guides the truck the radial bars cannot, hence either Bissell was entirely in error as to the effect of providing the truck with bars, or else the bars were as inoperative in guiding the truck on curves as are their equivalents, the loose chains.

But appellees will say Bissell was mistaken, and they will draw a straight line and a curve with a radius of a few inches, or two such curves in opposite directions, and represent how impossible it would be for an enormously exaggerated engine provided with a radius bar truck to follow such lines.

Bissell was a practical man, an old railroad superintendent, and he had in view not a geometrical problem but a railroad, built as railroads are built, so that trains of cars can be run over them. We might concede, though it is doubtful, that it would be possible to lay out a piece of track on which the engine without radial bars would travel more easily than one with such bars, but even if this feat should be accomplished it would have no more interest to railroad men than the ability of some of Mr. Barnum's horses to balance themselves on a see-saw has to the owners of carriages

Considering railroads as they are built, and taking the Pennsylvania Railroad as an example, we find that the sharpest curve in the main line of their road is what is familiarly known as the "Horseshoe Curve" a drawing of which faces page 315 of the record.

(Wilson, p. 181; Dripps, p. 327. Q. 40; Table of curvitures, p. 259–260 and 263.

Now, of the curves which make up the Horse-shoe, the sharpest has a radius of 637 feet, (see drawing,) and it is in passing this curve that the swing truck would have its greatest lateral motion and its greatest angular movement of rotation about its king bolt.

What is the extent of this, the greatest lateral motion? In the first place, what is the extreme limit of the lateral motion allowed for in the construction of the engine?

DUDLEY, P. 511, Q. 485:

"I never heard of an instance where there was a swing truck where it could swing two or three inches—two inches say—each way, being used on a road."

And afterwards, while being cross-examined about the experiments made by him at the Horseshoe Curve, the same witness testified as follows, page 548:

"Re-+ Q. 892. How far would the front of the locomotive have to swing over, where there was a play of one inch between the flanges of the tires and the rails, in going around this curve, in these experiments of which you speak, in order to bring the inside flange of the back driver in direct contact with the rail, and the flange of the front driver in direct contact with the outside rail?

A. ABOUT ONE INCH AND A QUARTER, THAT IS, THE SWING. It might swing a little more than an inch and a quarter over.

Re-+ Q. 893. Would the swing motion of the engine produce such a result before the engine had swung to the extent to which it could swing?

A. Bring the drivers up against the rails? Yes, sir.

Re-+ Q. 894. Why?

A. Because there was more movement in the links than an inch and a half; over two inches, in which it could play.

Re-+ Q 895. What are the lengths of the links on that engine?

A. They were six and three-quarter inches.

Re-+ Q. 896. How much would they have to lift to move sideways to the length to which you say they probably did move in that engine?

A. The outside link would probably have to raise nearly half an inch."

See also COLLIN, p. 581:

"+ Q. 36. Do you know in any case, with your engines, taking any curve you please, what the amount of lateral motion of the front part of the engine over the track was?

A. I THINK THE UTMOST AMOUNT IT CAN MOVE IS TWO INCHES EACH WAY BEFORE IT STRIKES.

+ Q. 37. What is the utmost amount it has ever moved in any case?

A. It depends a great deal on the speed you go; if you go very fast the momentum of the engine may take up all there is.

+ Q. 38. Did you ever know it to take up all the lateral motion?

A. Going around a very short curve, like that at Deep Fill, on the Tyrone and Clearfield Road, I think it would do it.

+ Q. 39. WOULD IT DO IT ON THE HORSE-SHOE CURVE?

A. NO, SIR; NOT UNLESS YOU WERE GOING AT A VERY HIGH RATE OF SPEED, AND THEN IT WOULD SWING OVER AND TAKE A GREAT DEAL MORE TO GO ENTIRELY OUT OF ITS WAY. IT WOULD TWIST THE ENGINE OVER AND GO TOO FAR."

The greatest lateral movement of the truck in going from Philadelphia to Pittsburgh cannot, then, be greater than ONE AND A QUARTER INCHES, and that only in the extreme and rather dangerous case of the engine going so fast

around the Horse-shoe as to cause the front driver to press against the outer rail, and the rear driver against the inner rail. And the greatest lateral movement on any curve, no matter how sharp, is ONLY TWO INCHES, for that is all the engine can move off the centre of the truck. The movement of rotation or slight turn on the king bolt which takes place simultaneously with the slight lateral movement, is only a matter of a small fraction of one degree. Its smallness is apparent at a glance, when looking at the curvature of the track and the relative size of the engine. And the expression "swiveling" applied to such a very diminutive edging off from a straight line seems almost absurd. It is apparent to the eye that the securing of the truck to a centre about nine feet away from the king bolt (for that, as applied to actual locomotives, is about the position recommended by Bissell,) will not exert any real influence on either of these very slight movements.

The mathematical "demonstration" on which the appellees base their theory of a difference in the motion of the confined and unconfined truck, proves altogether too much, for it proves beyond the possibility of doubt that, if you are content to consider a locomotive in the mathematical light, in which they alone will look at it, it cannot go around a curve at all.

For instance, following page 264 of the Record there are twenty-one sheets of drawings put in by the complainants' witness, Hudson, which show most conclusively that, granting the correctness of the appellees' theory as to the position of an engine on a curve, no fixed centre truck locomotive could run on the Horse-shoe without going off the track.

But they do not only run around the Horse-shoe without difficulty, but around curves of less than half of its radius, and on the Baltimore and Ohio Railroad, which is full of sharp curves, they have never used any considerable number of any but fixed centre locomotives, and the

result of the experience of the Pennsylvania R. R. has caused them to change every engine in their possession which had a laterally moving truck to a fixed centre. See

Howard, p. 585.
Harrison, p. 433.
Hodgman, p. 393–4; 399.
Collin, p. 579.

If one thing is more certain than another it is that the mathematical demonstrations on which the appellees have built so much has no real application to the question, and without exhausting the errors which it embraces, enough can be pointed out to show why it is necessarily and widely wrong, viz.:

It does not allow for the play both of the drivers and the truck on the track, from an inch to three-quarters of an inch in each case.

Coale, p. 382; 384.
Collin, p. 581. + Q. 31.
Dudley, p. 460, Q. 68.

It does not allow for the play around the king bolt—which varies between one-eighth and three-eighths of an inch.

Dripps, p. 341, Q. 172–2.
McQueen, p. 355, Q. 50.

It does not allow for the play of the axles in the boxes.

Coal, p. 387 + Q. 199.
Coflin, p. 582 + Q. 43.
" " 581.

In fact it does not relate at all to a real engine on a real track.

To talk about an engine running on a reverse curve very naturally would give the Court the idea, as it did the Court below, that the drivers would point in one direction

and the truck wheels in another, but as a matter of fact, if a curved track should run into a reversed curve, the junction of the two curves would for the distance covered by the wheel base of the engine (23 feet 8 inches for the largest engines), be practically a straight line and doubtless would consist of a single straight rail,—even if they should take pains to bend the rail in two directions, which they would never do, the curvature would be less than the amount of lateral play allowed for between the wheels and flanges and the engine would stand on such a track just as it would on a perfectly straight one.

Mr. Bissell knew these facts and knew that the radial bars would in no way interfere with such motions as the truck would be called upon to make by reason of any curvature in the track. And the proof that he made no mistake is, that even appellee's own witnesses admit that the radial bars were largely used and were so practically successful that Mr. Heden says he considered them of more importance and value than the truck. Not one of appellee's witnesses having any practical experience or real knowledge of railroads say one word about any difficulty having been met with in the use of engines provided with the radial bars, nor do any of them pretend that the use or non-use of the bars made any difference in the motion of the truck. See appellee's witnesses.

Buchanan, p. 17, Q. 33 to 36.
Heden, p. 163.
Hudson, p. 195, Q. 63 to 64.
Moore, pp. 205–6.
Hudson, p. 248.

Also appellant's witnesses:
Hill, p. 275. Q. 32.
Healey, p. 278, Qs. 5 and 6.

The opinion of the Court is based entirely upon the argument and the unsupported testimony of a most adroit expert witness, Mr. Renwick, who, in well turned periods, first describes how the swing truck will act beneath the locomotive, and then points out how, in his opinion, the motion will be affected by providing it with radial bars. Mr. Renwick does not pretend to have had any practical experience as a railroad engineer, nor does he pretend that he has ever examined or experimented with any engines provided with swing trucks, either with or without radial bars. His information is exclusively acquired from an examination of the patents, and his testimony utterly and entirely ignores all practical restrictions and allowances which would be made in practice. His testimony makes no allowance for any play either in the engine or on the track, except the play on the truck, and he speaks of curves without the least reference to the practical limitations of curviture in a track or the the relative size of the engine, and not only so but he disregards the weight and momentum of the engine, and deals with the question on the presumption that in going on a curve the drivers will "strive" to assume a position with their axles parallel to the radius of the curve, (see pp. 11 & 12 and elsewhere in his deposition), and that all the truck has to do is to let them do so. Now so far from this being true, the fact is, that the drivers are always "striving" to go straight ahead, and, consequently, when on a curve their tendency is always to get away from a position with their axles at right angles to the radius of the curve, or in other words, to leave the track. It is the purpose of the truck, acting through the leverage of the length of the engine, to pull the drivers around, and the laterally moving, as well as the fixed centre trucks, do this work in just the same way, as neither the planes or the links allow the truck to leave the centre of the engine except when a pressure is applied great enough to lift the

weight of the engine; hence, it is obvious that in going on to a curve the engine will first take up all of its free play on the track,—in its boxes,—and in all of its joints, before it takes up any of the restricted play allowed to it by reason of the laterally moving capacity of its truck. It,s position then on a curve must necessarily be very different from that assumed by Mr. Renwick, and must also differ very much from that indicated in the drawings introduced by Mr. Hudsen.

To sum up the whole matter,

First. The argument of the appellees accepted by the Court below, and embraced in its opinion, is shown to be founded on false premises.

Second. The movements of the truck and engine are very slight in extent and quite different from those assumed by the lower Court.

Third.—The radial bars were extensively and successfully used. Hence Bissell was right in asserting that they would not interfere with the relative motions of the truck and engine as controlled by the track.

APPELLEES HAVE SUSTAINED NO DAMAGES BY REASON OF THE ALLEGED INFRINGEMENT BY APPELLANTS OF THE SMITH PATENT.

The result of a long and thorough examination into the merits of the fixed centre, and laterally moving trucks was to convince the Master and the learned Court below that the appellants had derived no benefits whatever from substituting laterally moving for fixed centre trucks. Indeed the testimony showed most conclusively that so far from deriving advantage from the swinging truck its use had been from the first a mistake, and the appellants

proceeded at once to discard and replace them with fixed centre trucks.

The Master's report is printed pp. 136 to 149 of the Record, followed on p. 150 by the exceptions taken by the appellees, and on pp. 589 to 592 will be found the opinion of His Honor Mr. Justice Strong, confirming the Master's report, and finding as to the fixed centre and swing truck that the evidence showed that (p. 590):

> "THERE IS NO GAIN, PROFIT, OR ADVANTAGE IN THE USE OF ONE OVER THE USE OF THE OTHER."

The Master's report is so full, and contains such ample references to the testimony relied upon by him in arriving at his conclusions, that it is unnecessary to do more than refer the Court to it as the best and fairest argument we could make in support of the Court's finding on this point.

But the Master also reports that the appellees have shown that they had established a license fee of one hundred dollars per engine for the use of this Smith patent; and he finds therefore that they were damaged in this amount, plus the interest thereon, from the time when adopted, for every engine having a swing truck in the possession of the defendants. In this award the Master was confirmed by the Court below.

Now we submit that in view of the fact that this device of Smith's is shown not to be in the least an improvement over the trucks formerly used by the appellants, the proof relied upon to show an established license fee should be closely considered, for certainly where it is shown that a defendant using a patented device without malice—and with such reason for believing the patent invalid that the Court itself expresses a doubt—has derived no benefit from such use, the owners of the patent should be held strictly to certain, definite, and unambiguous proof of the facts from which the Court deduces the measure of their damages.

The Master himself, in his report p. 147, comments on the uncertainty and unsatisfactoriness of the proof from which he finds the measure of damages, and states, p. 148, that he fixes the sum of one hundred dollars "by putting a liberal interpretation upon the testimony on this subject." Not only is the appellee's testimony vague on this question of the amount of its royalty under the Smith patent, but it is also very short, being comprised in the testimony of two witnesses.

(1.) Mr. Blackall, (see p. 187,) who testifies that the railroad of which he is Master Mechanic—The Delaware & Hudson—paid one hundred dollars for such swing-truck locomotives as it built itself, but he does not say how many they have built, or whether they had ever built more than one or two.

(2.) Mr. Moore, the General Manager of the appellee's company, whose testimony will be found in the record, pages 175 to 180, and 204 to 206. In these eight or nine pages is found all the testimony on which the finding of the Court below is based.

Mr. Moore states that his Company have charged railroad companies a license fee of one hundred dollars per engine, and that they have charged builders seventy-five dollars per engine, but he does not state how many companies have paid the royalty he claims to have charged, nor does he name a single company, or state whether any one company has paid for any appreciable number, nor does he name a single locomotive builder who has paid the appellee the fee of seventy-five dollars, which he says was charged to builders.

The six hundred and twenty-two swing truck locomotives in the possession of the appellants, and on which the damages are calculated, were built as follows (pp. 148–9):

290 by the Penna. R. R. Co.
2 by the New Jersey R. R. Co.
1 by the Camden & Amboy R. R. Co.
3 by the Belvidere & Delaware R. R. Co.
295 by the Baldwin Locomotive Works.
2 by the Rogers Locomotive Works.
6 by the Norris Locomotive Works.
3 by the Patterson Locomotive Works.
8 by the Brandt Locomotive Works.
5 by Danforthe & Cooke.
4 by the Jersey Locomotive Works.

On seven of the above engines the New Jersey R. R. Co. paid as a license fee an amount not stated, but all the rest were built without any license from these appellees; from which it very satisfactorily appears that few if any of the builders of locomotives paid anything to these appellees. It may be true, as Mr. Moore says, that his company were in the habit of charging seventy-five dollars to the builders, but it is certainly true that the builders were not in the habit of paying any such sum.

To come down to the instances given by Mr. Moore where certain companies actually did pay the appellees something, we find first, that after resisting their claim in the Courts for a time, the Erie R. R. Co. settled the suit by paying Mr. Moore $4000, in full satisfaction for all claims against it.

Moore, p. 179.
License, p. 124.

The license specifically identifies by number fifty-four engines and applies to any others in their possession as well. Mr. Moore states that he was satisfied that these fifty-four engines were all they had on which no license fee had been paid. For these fifty-four engines, however,

Mr. Moore himself says they paid the "*usual rogalty fee*;" and four thousand, divided by fifty-four, is equal to $74.07 per engine.

The next instance where Mr. Moore gives names and amounts is in speaking of the settlement made by the appellees with the Western Railroad Association (page 205); in this case they received pay for eight hundred locomotives, at the rate of $30 per engine (Q. 3).

The only other builder or road mentioned by Mr. Moore is the Rogers Locomotive Works, who, he says, had a license from former owners of some of the patents owned by the appellees, at the rate of $55 per engine, which was assumed by the appellees (page 206). In not one of these instances is the statement of the witness as to the royalties "charged" confirmed, and it is apparent that their custom was to take pretty much whatever they could get.

For 54 engines they received $74.
" 800 " " " 30.
" 618 " " " 55.

These are the only facts proved.

But they did not receive these sums for the use of the Smith patent, but for the use of all of the patents owned by the appellees.

The license to the Erie Railroad Company specifies the following patents, viz.:

One to Bissell, dated August 4, 1857.
" " " November 2, 1868.
" Smith, " February 11, 1862.
" Pratt, " October 16, 1860.
" Hudson, " April 5, 1864.
" " " May 10, 1864.

See License, page 124.

This license, Mr. Moore states, was the same as issued to all railroads and builders by the appellees, p. 178.

"+ Q. 8. What does your license cover—the original term and possible extended term?

A. THE LICENSE COVERS THE RIGHT IN ALL OUR PATENTS. It gives the party taking it the right to all improvements that may hereafter be made upon these patents, or to any extensions thereof."

The Smith patent, then, was only one out of six patents, all of which were included in the license for which they "charged" Railroad Companies $100, and took what they could get. The appellees furnish no data from which the value of the Smith's patent alone can be deduced, and judged by the profit there is in using it, this was a wise course, for as the lower Court found, there was no advantage of any kind gained by its use. Hence it is fair to presume that the royalty paid by builders and railroads was paid for the right to use the other and presumably more valuable patents. That some of these other patents were sufficiently valuable to warrant a large manufacturer in paying fifty-five dollars per engine for the right to use them is shown by Mr. Moore's own testimony, p. 205.

"Q. 9. You say the average price of your fifteen hundred locomotives was only seventy dollars and a fraction, when you charged at that time, until the depression in business, seventy-five dollars to builders and one hundred dollars to companies; explain how it was, therefore, that your fifteen hundred locomotives only netted you seventy dollars and a fraction.

A. That was in consequence of two reasons, one of which was that *previous to the organization of the Locomotive Engine Safety Truck Company* SOME OF THESE PATENTS *were owned by* LEVI BISSELL *and others, and they had entered into a contract with the Roger's Locomotive Works, giving them the right to*

> *manufacture, and use the improvements for fifty-five dollars an engine, and when the company was organized it assumed this contract that was made by Bissell and others and carried it out.* The Roger's Locomotive Works have constructed a very large proportion of engines with the swing truck, and they have paid our people somewhere about thirty-four thousand dollars."

There is no allegation in this case that appellants have used any other of the appellee's patents than the Smith patent, and if they have not used them it seems scarcely fair to charge them with the full price paid by those who did use the five additional patents.

If, on the other hand, the appellants have used any of these other patents there is nothing to prevent suit being brought against them, and the same amount of royalty collected again and again.

Whatever the established license fee of the appellees may be decided to be, since it is the fee for a right to use six patents, it will undoubtedly be proper in ascertaining the amount of the fee which should be credited to any one of the patents, to deduct from the license rate any sum which is shown to be the regular license fee which was charged for the right to use any of the rest, and as Mr. Moore states that $55 was the regular fee charged for a license under the Bissell and some other patents, this amount, at least, should be deducted from the sum which they show to be the license fee for all.

To sum up.—Appellees have failed to prove that they ever received more than a single payment of one hundred dollars for a license.

They have shown payments at the rate of $74, $55, and $30, in different instances.

The Smith patent was but one of six patents under which these licenses were granted.

Some of the five patents are shown to have had an established license fee of $55.

The Smith patent is shown to be without value when used alone as these appellees used it.

We submit that these facts do not warrant a finding that the appellees were damaged to the extent of one hundred dollars per engine.

And further, we submit, that this is not a case in which interest should be allowed on the damages. Conceding that this is within the discretion of the Court there are certainly no circumstances in this case which should lead the Court to lean in favor of the appellees, whose unnecessarily obscure and indefinite testimony on the subject of their license rate is scarcely sufficient to enable the Master and the Court to determine on any sum as being "established" for the right to use not only the Smith but five other patents as well.

Were there no question as to the validity of this patent, yet it being shown that it is entirely without pecuniary or practical value over the devices formerly and contemporaneously used, it would seem that the appellees would be more than amply reimbursed for their damages by being awarded one-sixth of the sum they charged for the use of all their six patents.

Seymour vs. *McCormick*, 16 Howard, p. 491.
City of New York vs. *Ransem*, 23 Howard, 487.

GEORGE HARDING.
ANDREW McCALLUM.
FRANCIS T. CHAMBERS.

APPENDIX.

MASTER'S REPORT.

(See p. 136.)

REFERENCES CORRECTED TO CORRESPOND WITH THE RECORD.

In the Circuit Court of the United States for the Eastern District of Pennsylvania. In Equity.

THE LOCOMOTIVE ENGINE SAFETY TRUCK COMPANY *vs.* THE PENNSYLVANIA RAILROAD COMPANY. } April Sessions, 1873. No. 9.

To the Honorable the Circuit Court of the United States for the Eastern District of Pennsylvania.

The undersigned was appointed Master in the above case under a decree made twenty-fourth day of October, A. D. 1874, by which he was directed "to ascertain and take and state and report to the Court an account of the gains, profits, and advantages which the said defendants have received, or which have arisen or accrued to them by reason of such infringement of the said letters patent" (being the same which were granted to Alba F. Smith on the eleventh day of February, A. D. 1862) "since the date thereof; and also

that the said Master assess the damages sustained by the complainants, if any, by reason of such infringement of said letters patent since the date thereof."

The case has been presented before the Master with great thoroughness and elaboration, both in the taking of proofs and in argument, by Samuel S. Hollingsworth and Charles F. Blake, Esquires, for the complainant, and S. M. Whipple and Chapman Biddle, Esquires, for the defendant.

The first question which the Master deems it important to consider is, What is the patented device or invention which the company defendant has been decreed to have infringed? This point is in a large part settled, so far as the Master is concerned, by the opinion of Mr. Justice Strong, upon which the decree in this case was based. From that opinion, as well as from the patentee's description of his invention and claim, it appears that the subject-matter protected by the patent is not a truck, nor any feature of a truck, as such are alone, but a combination of a locomotive engine with a truck having pendent links as described in the specification, allowing a lateral motion to the truck, which has itself a rotary motion on the king-bolt, "whereby," in the language of the claim, "the drivers of said engine are allowed to remain correctly on the track in consequence of the lateral motion of the truck allowed for by such pendent links when running on a curve, as set forth."

The patentee also stated in his specification that the sidewise movement of the truck on a curve "not only causes the truck wheels to travel correctly on the track, with their axles parallel to the radial line of the curve of the track, but also elevates the outer side of the engine, preventing any tendency to run off the track upon the outer side of the curve."

The Master understands the patentee to have described, by the language thus quoted, the two leading features of his invention to have been, first, that in the combination before referred to the truck of the locomotive engine upon a curve would maintain a parallelism between its axles and the radius

of the curve; and, second, that the tendency of the engine to run off the track upon the outer side of the curve would be prevented by reason of the elevation of the outer side of the engine.

The combination protected is, moreover, not of a laterally moving truck with any particular kind of engine, or with any particular kind of driving-wheels connected with an engine.

This latter feature of the patent will, in the judgment of the Master, be of importance in reaching a correct conclusion upon the question whether or not the defendants have realized any profits, within the meaning of the law, by the infringement complained of.

It can hardly be doubted, in view of the case of Mowry vs. Whitney, 14 Wall., 620, and subsequent cases, that all for which the defendant will be answerable in the way of profits will be the gains or savings which have accrued from the use of the patented combination infringed upon, over and above what could reasonably have been realized from the use of any other combination accomplishing the same purpose which was open to common employment and use.

It is in proof and admitted that the company defendant, at the time when the combination before described was adopted by it, employed upon its railroad, as its standard engines, locomotives which had flanges on all their driving-wheels, in connection with trucks that swiveled on the king-bolts, but had little, if any, lateral motion. In view of this fact, the counsel of the complainant have contended before the Master that the measure of profits should be the savings or gains realized by the defendant by the use of the swing-truck (as the laterally moving truck has been commonly called in the proofs), in combination with an engine having flanges on all of its drivers, as compared with the use of a fixed truck (as the other kind has been described in the proofs), in combination with an engine having the same kind of drivers. Much evidence, however, has been produced on the part of the

defendant intended to show, and it claims, that even though the patented combination of the complainant were conceded to be superior to a locomotive engine equipped with a fixed truck and flanges on all its drivers, there is no advantage in the use of the former as compared with an engine having a fixed truck, and "blind" or "plain" front drivers, *i. e.*, drivers having no flanges.

It is, or may be, therefore, material to determine whether or not the position taken on behalf of the complainants is correct.

Upon this question the Master is with the defendant. As he has already stated, there is nothing in the patentee's claim or specifications which relates to either kind of driving-wheel. Proofs in the case show that the use of drivers without flanges was common before the patent in question was issued, as well as since. They also show that the laterally moving trucks have been and are used when the front drivers have no flanges. Unless, therefore, some reason exists in the mere fact that the defendant continued the use of flanges on all the engine-drivers when it began to use the swing-trucks why the comparison should not be made, irrespective of the question whether flanges are on the drivers, it would seem that there should be no restriction of the comparison to any particular kind of driving-wheels. The Master is unable to discover any such reason. Upon the question of profits, as distinct from damages, the complainant has the burden of showing that the defendant has gained or saved something, pecuniarily, by its infringement, not merely with reference to the means previously employed by it to produce a certain result, but, further, with reference to any other means which it might have employed for the same end, in common with the whole world.

Unless a patentee can show such an absolute advantage in the use of his patent over results which could be reached by other processes in common and unrestricted use, there has

been nothing really gained, no advance made, by his invention. In such a case, though he may maintain a monopoly over his patented machine, process, or combination, and exact such damages as he may be able to show he has suffered from an infringer, he cannot claim any portion of what has been realized in the use of his patent as profits in any sense owing or due to him, for the reason that the infringer could just as well have obtained such product or result without his aid or the benefit of his work or ideas.

It was contended before the Master that the case of Cawood patent, 4 Otto, 695, sustains the position taken on behalf of the complainant in asking that a decree for profits shall be made in its favor, based on the alleged advantage of the swing-truck combination over the fixed truck, flanged drivers being used in both cases. The Master, however, does not think that such an effect should be given to that decision. He does not understand that it was intended in any manner or extent to modify the ruling of the Court in Mowry vs. Whitney, *supra*, upon the proper mode of estimating the "profits," for which an infringer is accountable in equity. Had that been the intention, it seems altogether probable, particularly in view of the fact that the opinions of the Court in both cases were delivered by the same Justice, that the earlier decision would have been referred to and its true bearings specifically defined.

In the Cawood patent it is to be noticed that the infringer endeavored to shield itself from liability by showing that it would have been more profitable to cut off the damaged ends of railroad rails which had been in use than to repair them.

The Court, however, said, in effect, that the thing which the infringer attempted to accomplish by the use of the patent involved in that case was the repairing of the ends of the rails, and that whatever was saved by the use of the patent over the only alternate means of repair, the common anvil, was to be accounted for to the owner of the patent.

That the infringer might have saved more by not repairing the rails at all was an impertinent fact; as much so, it seems to the Master, as if it had been proven that it would have been more profitable to have kept out of the railroad business altogether.

In the case before the Master, however, the thing sought to be accomplished by the defendant, and that which the patentee proposed in the description of his patent to furnish, was a locomotive engine, so equipped with a truck and driving wheels that it could be used safely, economically, and effectively for the purposes for which locomotives were used, upon the tangents and curves of its line, with the least possible wear of tires and rails, and the least possible risk of running off the track. The use of flanges on all the drivers was not an essential part of any engine combination directed to the accomplishment of such a result, nor, in the opinion of the Master, can it properly be regarded a *sine qua non* in the demands or purposes of the defendant.

The Master will, therefore, feel at liberty to consider the question of profits with reference either to the use of blind or flanged driving-wheels under the engines between which the comparison may be made.

It is claimed on behalf of the complainant that there has been a pecuniary gain to the defendant from the use of the combination of the swing-truck with a locomotive engine in several particulars.

Witnesses have been examined who have practical experience with both kinds of trucks in connection with locomotive engines, and who express a decided preference for the swing-trucks in such combination.

According to the testimony given by them, when the swing-truck is used, the engine curves easier and is safer, and there is less wear on the boxes of the drivers and on the hubs of the wheels. They state, generally, that the engine moves more steadily and easily, either upon curves

or tangents, when so equipped than when a fixed truck is employed. The principal advantage, however, which is claimed is, that there is a saving in the wearing of the tires on the wheels of the engine, and three of the witnesses referred to estimate the extent of this advantage to be one hundred dollars per engine per annum, but, if the case should turn upon that point alone, it might well be doubted whether they have satisfactorily shown how they arrive at the estimate stated, or have placed such data before the Master as would enable him, in any event of the cause, to adopt it as a measure of profits. The three witnesses referred to are Mr. Morris, Superintendent of Motive Power and Machinery of the Housatonic Railroad (page 1, of complainant's proofs, Rec., page 152), Mr. S' gland, Superintendent of Motive Power of the Connecticut Western Railroad, and formerly connected with the Hartford and New Haven Railroad and with the New Jersey Railroad and Transportation Company (page 10 of the same, Rec., page 158), and Mr. Heden, who had been the same officer of the New Jersey Railroad Company (page 15 of the same, Rec., p. 161). The other witnesses mentioned are Mr. Sims, formerly Draughtsman of the New York Central Railroad (page 26 of the same, Rec., p. 168); Mr. Bloombaugh, Locomotive Engineer of the Delaware and Hudson Canal Company, (page 49 of the same, Rec., p. 183), Mr. Blackwell, Superintendent of Machinery of the company last named (page 53 of the same, Rec., p. 186); Mr. Keeler, Superintendent of the Flint and Pere Marquette Railroad (page 70 of the same, Rec., p. 197); Mr. Dawson, Master of machinery on the Delaware, Lackawanna and Western Railroad (page 76 of the same, Rec., p. 200); and Mr. Graham, Master Mechanic of the Delaware, Lackawanna and Bloomsburg Railroad (page 78 of the same, Rec., p. 202). The Master is asked to determine the amount of the defendant's profits at the rate of one hundred dollars per engine per annum, and no other standard is presented to him.

In other words, it is claimed that the effect of the swing-truck is to relieve the engine, when it strikes a curve, from the sudden shock or jar which it would otherwise receive in consequence of the front part being enabled, by the lateral motion of the truck, to conform approximately to the direction in which the engine was moving before the curve was reached. A part of this shock is said to be taken up by the truck, but modulated in consequence of the ability of the truck to adjust itself to the change in the track; and the structur eof the engine is said to be relieved of a part of the strain and wrenching by the fact that, as the front of the engine is moved from the position which it occupied over the truck when it was on the tangent, it is, by the operation of the pendent links, lifted, and the force of the blow is thus, in part, dissipated. A further, and the principal advantage is claimed to be, that the movement of the truck under the front of the engine allows the whole machine to take such a position that the axles of the drivers are parallel, or nearly so, to the radius of the curves, so that the tendency which is said to exist in the use of a fixed truck to cut or wear the tire of the front inner driver, on the rail on which it runs, as well as the tendency of the same driver to mount the rail, is materially diminished.

This last-mentioned claim seems to the Master to have been omitted by the patentee in his description of the advantages claimed by him for his invention. He appears to have thought that the effect of the lateral motion of the truck was to prevent the drivers from running off the outer side of side of the curve, instead of the inner. However this may be, it is evident that the witnesses, who have testified in support of the theory advanced in argument, as well as the the theory itseif, have reference to a fixed truck in connection with flanges on the front and other drivers of the engine.

If it were not for the fact, which is undoubtedly universal in the construction of railroads and their rolling stock,

irrespective of the kind of truck used, that a margin of space amounting, in many cases, to nearly an inch, and some times to over an inch (Hodgman, defendant's proofs, page 191, Rec., p. 392), is left between the flanges of the wheels and the rails, the advantage referred to would seem to exist to some extent when flanges are employed on all the drivers.

At least, it is probably true that, in such comparison, an engine with a swing-truck and flanged drivers could go around a curve which would stop the same engine with a fixed truck and flanged drivers, by reason of the greater mobility of the mass.

Practically, however, taking railroads as they are constructed, the defendant claim, and the master is much impressed by the testimony and the arguments bearing on its side of this question, that the engine equipped with a swing-truck having a tendency which the lateral motion favors and indulges, to keep on a tangent when it strikes a curve, the front outer driver is forced like a chisel against the rail, to the injury of both the flange and the rail. Doubtless this is to some extent restrained by the action of the pendant links, but not to the same extent that it would be if the front of the engine went at first with and over the truck into the curve and then sought the tangent. The fact that the opposite state of things exists does away, in the opinion of the Master, with much of the advantage which is claimed for the swing-truck in alleviating the effect of the blow which the engine receives when it enters a curve. There would seem to be, also, another fact which would tend to the same result. The cars attached to the tender of the engine would apparently draw the rear end of the engine towards the inside of the curve, and thus, as much as the limit of the motion would permit, and graduated also by the degree of the curve, tend to throw the forward end of the locomotive out from the curve, and bring the flange of the forward outer driver at an

angle to and facing the rail. In addition, it should be considered that except in curves of extremely short radii, the play ordinarily allowed between the flanges and the rails is sufficient to allow the passage of the flanges inside of the rails, even upon curves, and there appears to be no reason why this play could not safely be made sufficient to allow of such passage over any of the curves which the defendant has had upon its road, so far as the proofs show them to have been.

But, in the view which the Master takes of the case, it is not necessary for him to pursue further the comparison of the two combinations with reference to the employment of flanges on the front drivers. As already stated, he does not think himself restricted by the nature of the case to such a comparison, but on the contrary to be at liberty to compare the advantages of the complainant's combination with an engine having a fixed truck and no flanges on the front drivers. In his judgment, if such a comparison shall show that for all practical purposes an engine having a fixed truck and no flanges on its front drivers will traverse the road in all its parts as safely, easily, and advantageously in all respects as an engine having a swing-truck and flanges on all or a part of its drivers, there would be no basis for the complainant's demand for profits.

Indeed, in regard to the relative wear of the tires, which, as has been stated, is the only alleged advantage that the complainant has attempted to reduce to dollars and cents, the Master does not understand that any decree for profits is asked on the ground of any superiority in a swing-truck combination, when plain front drivers are used in connection with the swing-truck. However this may be, he has discovered no basis in the proofs for such a decree.

It will, therefore, only be necessary to make the comparison between the combination of a swing-truck with an engine having flanges on all its drivers, which the Master

understands to be the most approved, and the combination of a fixed truck with an engine having no flanges on its front drivers. This will be the most favorable view of the case for the complainants which can be taken, in a comparison including the element of plain drivers.

At the outset of this branch of the discusssion the Master states that, upon the proofs, he regards the use of the latter combination of fixed trucks with plain drivers as entirely feasible. Although one witness called on behalf of the complainant (Mr. Keeler, page 70 of complainant's proofs), (Rec., p. 197), says there is one curve on the Flint and Pere Marquette Railroad which he thinks an engine with fixed truck and blind tire would not go around, the weight of the testimony is overwhelming to the point that such an engine will easily traverse any curve which is practicable for railroad use. The curve to which Mr. Keeler referred was of two hundred and eighty-six and one-half feet radius, which is extremely short, and shorter by nearly three hundred feet than any which the defendant has had upon its road, with the exception of one of about three hundred feet radius, which it maintained during the Centennial Exposition in Philadelphia. Moreover, he admits that the curve spoken of by him could have been traversed by the engine which failed to do so, if its blind ties had been made wider.

The absence of flanges, it will readily be seen, enables the drivers to slide laterally over a rail as the engine comes upon a curve and assumes a position nearly equivalent to the chord of an art. In the case just spoken of the curve was sharp enough to permit the drivers to slide off the rails. On usual curves, however, this would not occur; and, in any practical case, the Master infers from the proofs that it could be prevented in either of two simple and customary modes. One has been referred to, that of widening the tire. The other is the putting of an extra rail inside of the curve. The ability of the driver thus to slide is claimed, and seems to be its

great merit. The result is, possibly, with some loss by friction and the wearing of the face or thread of the tire in the process, that the cramping of the engine on very sharp curves is largely prevented, and the severe cutting, which takes place in the flanges of the front drivers, is prevented. According to the testimony of Mr. Harrison (page 252 of the defendant's proofs), (Rec., p. 433), engines thus equipped were able to pass without trouble around a curve on the Baltimore and Ohio Railroad of one hundred and ninety-nine feet radius, leading to an engine-house, which the engines with swing-trucks and flanged tires would not pass without mounting the rail. A case is mentioned by Mr. Hodgman (defendant's proofs, page 191), (Rec., p. 394), similar to the last, in so far as the effect of the flanged tire is concerned.

The Baltimore and Ohio Railroad Company use engines with fixed truck and plain front drivers almost exclusively. The curves upon that road are more severe, and the grades quite as heavy as on the defendant's road, and yet it appears from the proofs that the rails of the former are worn principally upon the top, while those of the latter are worn principally upon the sides. While the Master does not regard this kind of evidence as necessarily conclusive, for reasons which will be referred to hereafter, the correspondence between the theory of the defendant and the actual result in the two cases, has some weight in support of the theory. The witness, Harrison, before-mentioned, though he has not had a very extensive experience with the use of the complainant's combination, has had enough to give to his opinion considerable value, and he expresses a decided preference for an engine with a fixed truck and blind drivers.

He also mentions the fact that certain engines which his company bought of the United States Government, having swing-trucks and flanged drivers, were altered to fixed trucks and blind front drivers, by reason of the advantage thought to be in the latter combination.

The testimony of Mr. Kettendorf, the Master Mechanic of the New York, Hartford and New Haven Railroad, is also strongly in favor of the blind tire with a fixed truck (page 13 of defendant's proofs), (Rec., p. 280), as likewise that of Franklin Roop, Master Mechanic of the North Pennsylvania Railroad (page 182 of same), (Rec., p. 388), and Charles T. Parry, for a long period connected with the well-known Baldwin Locomotive Building Works, in Philadelphia, (page 231 of same), (Rec. p. 420). These have all had experience with both combinations, and their testimony is not only positive in favor of the superiority of an engine having a fixed truck and blind front drivers, but the reasons given by them, as based on their experience, seem to the Master to be of great force. In this connection, too, it may be said that the experience of trustworthy witnesses is of the most value, in the determination of such a question as is now before the Master. He must rely upon it, rather than upon theories, however correct they may seem to be, as such. It is the test of practical working which must decide their practical value.

Besides the witnesses who have just been referred to, there are others who have had experience in the use of the swing-trucks, and who testify that, generally, they do not work to advantage or profit, for the reason that they permit the front of the engine to get over so far to one side that they "crab" the engine, or that they give a lurch to it, or that they cause the engine to track badly, and permit it to become "lop-sided," or that they produce an excessive wearing of flanges, in comparison with fixed trucks. Some of these, as well as others who have been previously mentioned, state that they found it an advantage to change the swing-trucks to fixed, either entirely or approximately, finding the advantage of the change to increase, according as the altered truck approached a "fixed" character. They also say, that there is greater cost of original construction and current maintenance in the case of the swing-truck. Mr. Stratton (defendant's proofs,

page 124), (Rec., p. 307), states that the total amount of this excess paid by the defendant, during the time it has used the swing-truck, has been $47,611.12. The witnesses, whom the Master has in mind in this connection, are Mr. Hill, Superintendent of the Eastern Division of the New York and Erie Railroad (page 1 of defendant's proofs), (Rec., p. 272); Mr. Healey, builder of locomotives at Providence, Rhode Island (page 10 of same), (Rec., p. 278); Mr. Smith, who had been General Foreman on the Hudson River Railroad (page 135 of same), (Rec., p. 358); Mr. Beardsley, Master Mechanic of the Philadelphia and Erie Railroad (page 138 of same), (Rec., p. 360); and Mr. Coale, Master Mechanic of the Northern Central Railway (page 157 of same), (Rec., p. 372). Other witnesses, such as Mr. Eddy, Master Mechanic of the Boston and Albany Railroad (205 of same), (Rec., p. 403); Mr. Mulligan, Superintendent of the Connecticut River Railroad (page 215 of same), (Rec., p. 410); and Mr. Hodgman, Master Mechanic of the Philadelphia, Wilmington and Baltimore Railroad (page 189 of same), (Rec., p. 393), have testified that they find a fixed truck and plain drivers serviceable, convenient, and safe for the uses of their roads. The last witness named has, also, had some valuable experience with swing-trucks.

Besides, there are several witnesses connected with the defendant company, whose testimony, if it be true—and the Master would have no other reason to separate it from other testimony which has been given to the same effect, than that they are employed by the defendant—would warrant the conclusion that, even when there are flanges on all the drivers in both cases, there is less wear on the boxes, hubs, flanges, and rails in the use of the fixed truck than in the use of the swing.

The Master has not deemed it to be his duty, or, under the rule of Court defining the manner in which such a report shall be prepared, his privilege, to quote the testimony of the

witnesses named at length. If he were to do so, or to analyze and compare their testimony in detail upon paper, his report would necessarily be of inordinate length. He has, however, carefully done this in the study of the case, and has as carefully considered the criticisms and arguments which counsel have made upon the proofs, and the result of it all is that he has reached the conclusion that an engine furnished with a fixed truck and blind front drivers is as convenient, economical, and serviceable for the traction of trains on tangents and curves as an engine furnished with a swing-trnck and any kind of driving-wheels in use.

The weight of the testimony is, in the judgment of the Master, decidedly to this effect. Indeed, he thinks it will be doing no injustice to the complainant for him to say that there was very little testimony in the case which would warrant an unfavorable judgment upon the combination of fixed trucks and plain drivers. The complainant, acting, it may be supposed, under the view of the case which has been urged upon the Master, seems intentionally to have ignored that combination as unworthy of serious consideration. Even, however, if the opinion of the master were not what he has expressed, he would be utterly at a loss how to estimate profits in favor of the swing-truck combination in such a comparison as he has made, for the reason which he has just stated, and especially because the profits alleged to exist to the extent of one hundred dollars per engine per annum are based upon the alleged wear of tires under different conditions from those which are found when plain drivers are used. As has already been said, no other standard than that just referred to has been placed before the master. The only question about which he has had any hesitation in this comparison, after the study he has given to the case, is the relative safety of the two combinations—a matter undoubtedly of prime importance. Aside, however, from the fact, which he has already intimated, that he is not satisfied from

the proofs that any real, practical, pecuniary advantage has been shown to exist in the swing-truck combination under any of the conditions to which the defendant's engines have been subjected, the Master is, on the whole, of the opinion that he would not be justified in determining the question under consideration against the defendant upon that ground. There is no proof before him of any accident ever having occurred in consequence of the front or any other drivers of an engine being made plain. On the other hand, there is no doubt that such drivers are and have long been in use on railroads which have subjected them to severe tests, and where, as the proofs show, they work to advantage and safely. While it is true that a few of the witnesses have expressed the opinion that it is safer to use flanges on all the drivers, their opinion is not, so far as appears, based on any facts within their knowledge. On the other hand, it may well be doubted whether any apparent danger arising from the absence of flanges is not more than counter-balanced by the increased strain on various parts of the engine when flanges are used on all the drivers, and the consequent liability to fracture and accident.

In arriving at the conclusion expressed the Master has not overlooked the testimony of Mr. Hudson, who has given scientific reasons, based principally on theories, in favor of the swing-truck in combination with an engine.

Nor has he lost sight of the fact that the use of the combination of the complainant by the defendant is in itself a sort of admission against the latter.

However, in the experiments which the defendant company, like all similar corporations, have been making in the practical development of railroad management and appropriate machinery, the Master does not think such a fact should be regarded as by any means conclusive. Besides, it appears that the defendant has determined upon, and given orders for, the abandonment of the combination referred to.

It would hardly seem reasonable that this course should have been taken merely to avoid the payment for a short period of time of even what the complainant demands, if the company had not become satisfied that their experiment with the swing-truck was a mistake, particularly if there are such pecuniary advantages in its use as the complainant claims. Such a course would be very short-sighted. Nor would it be proper, in the absence of some evidence to that effect, to infer that the action of the defendant has been taken in bad faith, for the purpose of influencing the mind of the Master or the Court. Assuming that its course is dictated by considerations which ought to influence a great corporation, to which are entrusted large responsibilities over lives and property, it would seem that the abandonment by the defendant of the use of the complainant's combination largely does away with the effect of the admission of its relative utility arising from its use, nothwithstanding the order for its disuse was given so late in this controversy.

There has been much testimony produced by both sides intended to show, by the number of miles run, either during their lives or before turning, a greater mileage for the tires of wheels connected with engines of one or the other of the two combinations referred to. The Master finds nothing in this branch of the proofs which militates against the conclusion already expressed by him; but he does not think that such testimony, unless developed to a larger extent and more particularly than it has been, would afford a safe basis for judgment. In a comparison of such milage upon different railroads, it is obvious that there are many conditions, such as the state of the track, the weight of the engines, the quality of metal, the character of workmanship, the perfection of machinery, and the number and weight of cars drawn, which would or might be different, and yet they would all more or less affect the wear of tires. The same elements would also to some extent differ even upon the same railroad, as is indicated by the very considerable variations

which are shown by the proofs to exist in the mileage of engines having the same kind of trucks in similar use upon the defendant's railroad, as also upon the Baltimore and Ohio Railroad. To make the mileage run of much value as a test in the one case or the other there should be a comparison of a large number of engines, and a consideration of the elements before referred to so far as possible, Otherwise, the difference of three or four per cent. shown by some of the proofs might improperly be ascribed to the effect of the truck in the engine combination.

The same kind of criticism may be put upon the exhibits offered to show the relative flange and rail wear when swing or fixed trucks, respectively, are used. Undoubtedly, taken as a whole, these exhibits do show that the flanges of the outer drivers and the outer rails on curves, which are thus exhibited, are worn more than the inner, which corresponds with the defendant's theory as to the effect of the swing-trucks; but the Master does not think that he would be justified in regarding such evidence as decisive of the case, unless the specimens of wear shown were more numerous than they are, and the conditions to which they were subjected, and their history, were defined with greater accuracy. Besides, in regard to the wear of rails, it is evident that the action of the numerous car wheels must be a serious element for consideration.

There have also been some elaborate experiments performed with instruments intended to measure and record the force used to propel or push engines having in one set of experiments swing-trucks and in another the fixed. These have been made the basis of highly-wrought calculations and testimony, which the defendant claims, show the superiority of the fixed truck over the swing. Doubtless, as stated, they do so, but the complainant complains that they are unreliable, because the experiments were made in an improper manner to get accurate results, and because such results as were obtained were not correctly translated or calculated.

Without going into details to explain his reasons, the Master would say that the reasons given for this objection so far commend themselves to his judgment that he does not rely upon the results shown by the experiments in the formation of his conclusion upon the whole case.

A similar remark may be made with reference to some experiments performed with "runaway" engines, as they were called, on the Baltimore and Ohio Railroad. These were engines with their connecting rods detached so as to give full play to the wheels, which were propelled by a pushing engine along a level course to a common point of decline, when they were allowed to go down the grade, under the impulse received and the effect of the gravity, until they stopped.

The results are claimed on behalf of the defendant to be in favor of the fixed truck, and they appear to be so on their face, but the complainant says that this is not a fair test, for the reasons, first, that the distance which an engine equipped with either kind of truck would run under such conditions would depend very largely upon the initial velocity, which was not accurately known; and, second, that the uncoupling of the connecting rods placed the swing-truck at a disadvantage, in consequence of the engine being thereby thrown out of its counter-balance.

The Master is satisfied that there is much force in these reasons, and he, therefore, places no great stress upon the experiments referred to.

It is sufficient for the Master to add, upon the question of profits, in view of what he has already stated, that he does not find in the proofs that which satisfies him that the defendant has received any gains, profits, or advantages by reason of its infringement of the complainant's letters patent, within the meaning of the decree, or that such gains, profits, or advantages have accrued to it by reason thereof.

It only remains to consider what damages should be assessed in favor of the complainant under the decree. The

point has been made that this is not within the province of the Master; because there is no prayer for such relief in the complainant's bill. It does not, however, seem proper to the Master that he should discuss this question. The terms of the decree already cited are binding upon him, and they are explicit that he should assess such damages. It is then urged for the defendant that no damages have been proven. It is, without doubt, true that none have been, unless there has been shown such an established royalty for a license to use the complainant's combination as will, under the law, afford a standard for the computation of damages. That such a royalty will afford a proper standard in case of an extensive and protracted use of a patented invention without palliation or excuse seems to be well settled by the decision of the Court in Birdsall *vs.* Coolidge, 3 Otto, 70. There is no doubt that the defendant has made such "extensive and protracted use" of the complainant's combination, and the Master knows of no "palliation or excuse" for it. He must, therefore, apply this standard in the estimation of the damages, provided it shall appear that the existence of such an established royalty is made out.

What is an "established" royalty? It certainly would not be a royalty fixed by a sale of a single license or of licenses sold to a single person. Much less would it be the price which a patentee might arbitrarily put upon a license. It would rather seem to be the price which experience has shown the inventor has been able to realize therefor from a sufficient number of parties to make it proper to say that the royalty alleged to exist has become recognized as the proper or usual price for the privilege of using the invention. How many would be sufficient? is the open question. Its solution must, in the judgment of the Master, depend upon the facts of each case.

In the case in hand, with the exception of Mr. Blackall (complainant's proofs, page 56, Rec., p. 185), who said that

the railroad company with which he was connected paid a royalty of one hundred dollars per engine for the license in question, the only witness who testifies on the subject is Mr. Moore (pages 37 and 83 of complainant's proofs, Rec., pp. 175 and 204), the Secretary and General Manager of the company complainant.

According to his testimony the royalty invariably charged to railroad companies has been one hundred dollars per engine. He does not say how many companies have paid it or on how many engines it has been paid at that rate. The testimony of the witness might advantageously have been made more full and explicit upon this point. As it stands, the Master must necessarily be in the dark as to the extent to which such a royalty has been paid. It is clear that the larger part of the licenses has been paid for through the manufacturers. Excepting in cases of compromise with the railroad companies themselves, the Master presumes that direct payment by such companies has been exceptional, for the reason that they would naturally seek, and any manufacturer naturally deliver, an engine in a condition to be used without objection from anybody.

The royalties charged to locomotive builders have been seventy-five dollars per engine, excepting for narrow-gauge engines, until the recent financial depression, when they were reduced to fifty dollars. The difference, according to Mr. Moore, was considered by the complainant as a commission for the collection of the royalty.

It must have been, however, that not a few of the railroad companies themselves have built engines with the swing trucks, and to these, the Master understands, the royalty has been one hundred dollars per engine.

Assuming this, and putting a liberal interpretation upon the testimony on this subject, the Master has concluded to adopt the standard suggested and estimate the damages at the rate of one hundred dollars per engine, not regarding

the several compromises which the complainant made with infringing companies at less rates, as affording or necessarily affecting the proper measure to be applied.

To arrive at the aggregate amount of the damages which the complainant is entitled to recover in this action, it is only necessary to determine the number of locomotive engines used by the defendant which are or have been covered by the patent in question, and upon which royalties have not been paid.

In the consideration of this branch of the case the Master thinks it proper to state that he prepared his report originally upon the theory that the complainant only asked to have damages estimated with reference to the engines which have been used by the defendant in the Eastern District of Pennsylvania.

Having submitted the report thus drawn to the counsel of the respective parties, he was requested by the counsel of the complainant to include in the computation all the engines having the swing-truck combination which the proofs show the defendant has used anywhere.

The Master afforded an opportunity to the defendant's counsel to be heard in opposition to this request, and Mr. Biddle appeared before him and resisted it.

After consideration of the subject, however, the Master is of the opinion that there is nothing in the nature of the action which should make it local in its application, or prevent its embracing infringements committed by the defendant irrespective of their locality. Besides, the same point in substance has been passed upon in this circuit in the case of Thompson et al. vs. Mendelsohn, 5 Fisher, 187, and the opinion of the Court therein was in favor of the enlarged jurisdiction. This decision should control the Master in this case.

In view of the fact, however, that the case as presented and pressed on behalf of the complainant seemed rather to

relate to the engines used in the Eastern District of Pennsylvania, the Master, after reaching and announcing the conclusion which he has just stated, also afforded to the defendant an abundant opportunity of presenting any additional proofs which might bear upon the claim of the complainant as now considered.

At a meeting before the Master, held for the purpose of enabling such proofs to be given, it was agreed by the counsel of the two parties that the Master should take the following statements, with the same effect as if Mr. Theodore N. Ely, the Superintendent of Motive Power of the defendant, were present, examined, and so testified, viz.:

First.—That the number of engines having the swing-truck on the Pennsylvania Railroad was six hundred and twenty-two, and not six hundred and twenty-four, as stated by George W. Stratton in his testimony.

Second.—That of the said six hundred and twenty-two engines, two hundred and ninety-six were built respectively as follows: Two hundred and ninety by the Pennsylvania Railroad Company, two by the New Jersey Railroad and Transportation Company, one by the Camden and Amboy Railroad Company, and three by the Belvidere and Delaware Railroad Company; and that of the remaining three hundred and twenty-six engines, two hundred and ninety-five were built by the Baldwin Locomotive Works, two by the Rogers Locomotive Works, six by the Norris Locomotive Works, three by the Lancaster Locomotive Works, three by the Patterson Locomotive Works, eight by the Brandt Locomotive Works, five by Dunforthe & Cooke, and four by the Jersey Locomotive Works.

Third. That as to one of the said locomotives, which was built by the New Jersey Railroad and Transportation Company two, the building of which was begun by the last-named company, but completed by the Pennsylvania Railroad Company, and five, built for the New Jersey Railroad

and Transportation Company by the Baldwin Works, royalties for the use of the swing-trucks have been paid.

Nothing in the nature of proofs was offered upon the point in question, nor was any further opportunity of producing such proofs asked on behalf of the defendant.

It is thus made clear that the defendant has used upon its road six hundred and fourteen locomotive engines having the swing-truck, for which, so far as appears, no royalties have been paid. The Master is asked, on behalf of the defendant, to assume in making the computation of damages that the royalties have been paid in the cases of all the engines which were built by any of the locomotive-building works before referred to. The propriety of such a course is not, however, apparent to him. On the contrary, he thinks the burden of showing the payment of such royalties if it has been made, is on the defendant; as much so when the locomotives were built by independent manufacturers as when built by the defendant itself.

In the absence of any proof upon that point, the Master must infer that no royalties have been paid upon any of the six hundred and fourteen locomotive engines before mentioned.

According to the testimony of Mr. George W. Stratton (defendant's proofs, page 123, Rec., p. 350); these engines at the time when he testified, viz., June 6th, 1876, had been in use an average time of about four and one-half years.

Calculating the royalties upon the six hundred and fourteen engines at the rate of one hundred dollars per engine, and allowing interest for the average time of seven years and eight months at the rate of six per cent. per annum, the Master obtains the amount of eighty-nine thousand six hundred and forty-four dollars, which sum he assesses as the damages sustained by the complainant by reason of the infringement of the defendant of the patent in question.

The Master will file in the office of the clerk of the court, in connection with this report, printed copies of the proofs

and exhibits which have been submitted before him, in accordance with the consent and agreement of the counsel of both parties.

All of which the Master respectfully submits to the court.

ROBERT N. WILLSON, *Master.*

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Supreme Court of the United States.

No. 44.

The Pennsylvania Railroad Company, Appellants,

vs.

The Locomotive Engine Safety-Truck Company, Appellees.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania.

S. S. HOLLINGSWORTH,
EDMUND WETMORE,
For Appellees.

Allen, Lane & Scott Printers, 229-231 South Fifth Street, Philadelphia.

Supreme Court of the United States.

The Pennsylvania Railroad Company, Appellants,

vs.

The Locomotive Engine Safety Truck Company, Appellees.

No. 44.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

This is an appeal from the decree of the Circuit Court of the Eastern District of Pennsylvania, deciding that letters patent of the United States, granted Alba F. Smith, February 11th, 1862, numbered 34,377, are valid; that the Pennsylvania Railroad Company has infringed the same; and awarding damages for such infringement.

The main question in the case is the validity of the letters patent. It is not denied that the defendants have infringed them, and the exceptions that were filed to the master's report awarding damages, and overruled by the court, will not need much consideration.

VALIDITY OF SMITH'S LETTERS PATENT.

A brief outline of the state of the art at the time of Smith's invention is necessary before the points, upon

which the appellants rely to show the invalidity of Smith's letters patent, can be intelligently examined.

STATE OF THE ART.

Prior to 1841 trucks free to swivel around their king-bolts, so as to allow a horizontal rotary motion of the truck-frame, independently of the *car* frame or body, under each end of a *car*, were known. [Record, page 111.]

In 1841 Davenport & Bridges obtained letters patent for car trucks,which were not only free to swivel round their king-bolts, but also had a lateral movement under the *car*. And they confined themselves to the method they described of overcoming the difficulties "incident to railway *cars* of the kind known as the long car." The method they described was the use of a swinging bolster or platform, suspended by pendent links from the truck frame, in which bolster or platform the king-bolt connecting the frame of the car to the truck was fitted. [See Record, pages 107–112, and particularly pages 110 and 111.]

In 1857 Levi Bissell obtained letters patent for attaching trucks to locomotives, so as to obtain a lateral movement of the truck under the locomotive. His method was by having a curved slot on the truck frame, in which a similarly curved block either surrounding and attached to the king-bolt, or attached to the bottom of the locomotive, moved. The curved block and the curved slot constituted the arc of a circle of which the centre was a point about midway between the centre of the drivers and the centre of the truck.

The truck moved horizontally in an arc around this point or "axis of motion," and the slot and block which moved in it were kept in the same arc of motion by two radial bars pivoted together at the rear ends at the "axis

of motion," and attached at their forward ends rigidly to either side of the back of the truck. The slot was arranged with inclined planes to resist the lateral motion. [Record, pages 116–120.]

In 1859 Kipple & Bullock obtained letters patent for an improvement on the Davenport & Bridges truck, which consisted in spreading the pendent links at their lower ends, thus utilizing the weight of the front end of the locomotive to resist the tendency of the locomotive (free to move laterally over the truck wheels) to depart from the line of the track.

Smith made his application for letters patent on July 10th, 1861. [Record, page 31.]

In 1851 his attention was first called to the necessity of giving the trucks of all eight-wheel locomotives lateral motion. His first plan was by giving the necessary lateral play through the journal boxes on the axles. In the summer of 1853, while in New York under medical treatment, Smith had frequent conversations with both *Bissell* and *Bridges* in regard to the best plan of constructing engines for running curves.

In 1856 Smith became general superintendent of the Hudson River Railroad, and continuing his experiments in September, 1858, Smith had finished and put upon the Hudson River Railroad his first experimental locomotive with a swiveling truck, from which was suspended by links inclining outward at their lower ends a bolster or platform to which the body of the locomotive was attached by the king-bolt.

This engine was run on the road, but not on fast trains. Smith continued to watch and examine the operation of this engine, and decided upon alterations in the length and divergence of the links, then had a second engine built which was put on the road in July, 1860. Shortly afterwards he had three others made with slight changes, the result of experiment, and then finally settled upon a

construction which suited, and made application for the patent which was granted him. [See Record, pages 15–16 Buchanan, and pages 20–24 Smith.]

In view of this state of the art the appellants make the following assignments of error. They say the court below erred—

First.—In finding that the Smith patent was for a combination of a laterally moving truck with a locomotive engine, and not for a truck *per se*.

Second.—By holding that there was any patentable invention in view of the state of the art in placing a swinging truck beneath a locomotive engine.

Third.—In finding that the alleged invention of Smith was not anticipated in the patent to Bissell.

Fourth.—In finding that the patentee, Smith, had not abandoned his invention to the public and forfeited his right to obtain a patent therefor by its public use for more than two years before his application for a patent therefor.

FIRST.

SMITH'S PATENT IS FOR A COMBINATION OF THE LATERALLY MOVING TRUCK DESCRIBED, WITH A LOCOMOTIVE ENGINE, AND IS NOT FOR THE TRUCK ALONE.

Smith's truck, considered by itself, was not originally invented by him. The Kipple & Bullock truck is essentially the same as Smith's. Kipple & Bullock obtained a patent for their truck on December 20th, 1859. [Record, page 105.] And a substantially similar truck was in

public use in 1852 on the Vermont Central Road and on the Connecticut River Railroad in 1856.

It is true that Smith in his specification describes his invention as "an improvement in trucks for locomotive "engines," and states that "in the drawing I have repre- "sented my improved truck itself;" but this language must be read in connection with the rest of the specification. And when so read, it is at once apparent that when speaking of *his* truck and describing its construction, he is speaking of the truck to be employed in combination with a locomotive engine. He says, "Several "laterally moving trucks have heretofore been made and "applied to railroad cars. My invention does not relate "broadly to such laterally moving trucks, but my said "invention consists in the *employment, in a locomotive* "*engine* of a truck or pilot wheel provided with pendent "links to allow of a lateral movement, so that the driv- "ing wheels of a locomotive engine continue to move "correctly on a curved track, in consequence of the "lateral movement allowed by said pendent links, the "forward part of the engine traveling on a tangent to the "curve, while the axles of the drivers are parallel or "nearly so to the radial link of the curve." [Record, page 30.]

His claim is as follows :—

"I do not claim laterally moving trucks, nor pendent "links separately considered; but what I claim and de- "sire to secure by letters patent, is the *employment in a* "*locomotive engine* of a truck, or pilot wheels, fitted "with pendent links '*o o*' to allow a lateral motion to "the engine, as specified, whereby the drivers of said en- "gine are allowed to remain correctly on the track in "consequence of the lateral motion of the truck allowed "for by said pendent links, when running on a curve, as "set forth."

It is clear, therefore, from an examination of the specification itself, that although the patentee minutely describes the kind of truck he uses in his locomotive, that what he claims as his invention is not the *truck*, but such a truck in combination with a locomotive, so as to allow the drivers of such locomotive, which are rigidly attached to the body of the engine, to remain correctly on the track, on a curve, or upon entering or leaving a curve, in consequence of the lateral motion of the truck under the body of the engine.

SECOND.

THE COMBINATION OF THE TRUCK, WITH THE LOCOMOTIVE IS PATENTABLE.

It is said that this combination is not patentable, because substantially the same truck having the same lateral and the same swiveling motion had been used, and was well known and old, *under each end of a car*. It was urged in argument in the court below, in effect, that Smith's invention was nothing more than blocking the truck at one end of the car, so that it was no longer free either to swing or to swivel, at the same time leaving the truck under the other end, as described by Smith's patent, free both to swivel and to swing, and that this was not invention. Without attempting to draw the line between where invention begins and ordinary mechanical skill ends, we may safely rest on this proposition: *that a combination of elements old in themselves to produce a new and useful result, is always patentable.*

In order to understand whether any new and useful result in a locomotive was attained by Smith's invention it will be necessary, in the first place, to consider the mode of operation of the old locomotive as compared with the operation of the locomotive as improved by

Smith's invention. The old locomotive, like the Smith locomotive, had fixed drivers. The driving wheels were rigidly attached to the body of the locomotive; and they could neither swivel nor swing. The truck was attached to the front end of the locomotive by a king-bolt, around which it was permitted to swivel, but was held by the king-bolt so that no lateral motion under the body of the locomotive was possible. Upon entering a curve with a locomotive of this kind, the body of the engine and the drivers would tend to move on in the line of motion of the locomotive before the curve was reached, in a line tangential to the curve. The truck wheels, of course, followed the curve, and the centre of the front part of the locomotive, being rigidly held by the king-bolt in the centre of the truck (the king-bolt being the centre of the truck), the front end of the locomotive was forcibly pulled around, and, as a necessary consequence, all the drivers were more or less skewed upon the rails, according to the sharpness of the curve, and the inside front driver and the outside back driver were made to grind against the rails, while the outside truck wheels were pressed against the outside rail with all the force arising from the tendency of the locomotive to keep in a line tangential to the curve. If the curve was very sharp the truck wheels were liable to mount the outer rail, and the drivers to run off the track on the inside of the curve.

This difficulty that locomotives had in running around curves is very clearly described in the specification of Mr. Bissell's patent. He says :—

"The ordinary (*a*) * * * locomotive, in running "around a curve, assumes the position shown. The axle "of the driver is not on the line of the radius, in conse-

(*a*) The specification says "*six-wheeled* locomotive," but adds immediately after, that the same is true of locomotives of *eight* or more wheels.

"quence of the same being at right angles to the platform. "The truck carries the forward end of said platform on to "the curved line. Hence, the flanges in contact with the "rail towards the sides '1 1' grind against the rail, and "the flanges on the sides '2 2' are relieved, and there is "a constant, sideways, sliding motion on the rail, and in "consequence, forcing the drivers in a deflective line, or "sideways, from that of a cylindrical, forward, rolling "motion. The truck is constantly by this means borne "to the outer side of the curve, and the engine has a "tendency to go off in the direction of the arrow (out- "side), particularly in case a broken rail or obstruction "occurs, when the truck swivels around on its centre pin, "throwing the locomotive off the track, greatly to the "risk or to the injury of life and limb."

In order to avoid the difficulty arising from the twisting, it was common in the old style of locomotives to have no flanges on the front drivers and an inside rail, so that the drivers being without flanges, when the twisting occurred on a very sharp curve they slid over on to this inside rail.

The same difficulty occurs in passing from a curve into a straight line, and the strain on the locomotive, and the tendency to run off the track with the old style of locomotive, is increased where you pass from one curve to a reverse curve, because you not only have the strain (already described) caused by passing from the curve into a straight line, but you have also the additional strain on the drivers caused by passing *instantly* from a straight line into a curve.

On the other hand, with the Smith improvement, on entering a curve the truck wheels, as before, follow the line of the curve, but being free to move laterally under the front end of the locomotive, the body of the locomotive is allowed, to the extent of this lateral movement,

to retain its natural position, in a line tangential to the curve, and in this way the skewing of the drivers and the pressure on the outside rail by the truck wheels and the inside rail by the front driving wheel is obviated.

[See evidence of Henry Waters, defendant's expert, Record, page 86, Ans. to Int. 4; also evidence of Renwick, complainant's expert, Record, pages 11 and 12.]

Both experts agree in this advantage of a *laterally moving truck* over the old rigid truck.

Thus, by the use of the old swinging truck in a locomotive engine, we have obtained a new and useful result which was impossible in the old style of engine, which had no swinging truck. We have not, therefore, a mere bare, naked, double-user of an old device, but have combined a known device with a locomotive to produce a useful result never before attained.

And this result, viz., of keeping the axles of the wheels radial to the line of curvature, is one which was attained in the case of railway cars *before* their trucks were made to have any lateral motion. It was accomplished by the *swiveling* on the king-bolt alone at *each* end of the car. The function of the swing truck in the locomotive is *different* from its function on a car, because there can be no *swiveling* of the drivers.

The object of the Bridges & Davenport car truck (and the Kipple & Bullock improvement on that invention) and its operation was *not* to aid the truck-wheels in getting around a curve. As long as *both* trucks were free to swivel they necessarily conformed to the position of least resistance, and were consequently controlled in their position by the track, and this is undoubtedly the best plan for passing a curve. The swing motion was added merely to avoid the sudden shocks and jolts on striking a curve or inequality on a tangent. There is not a word in either Davenport & Bridges or Kipple & Bullock about any advantage in getting round curves so far as the *position* of the *car* wheels is concerned.

Davenport & Bridges say: "Be it known that we, the "said Charles Davenport and Albert Bridges, have in- "vented a new and useful improvement in railroad car- "riages, by which the inconvenience to passengers arising "from the sudden lateral motion of the wheels is obvi- "ated; and that the following is a full and exact descrip- "tion of the same, reference being had to the accompa- "nying drawings, which, taken in connection herewith, "form our specification setting forth the principles of "construction of our improvement (by which it may be "distinguished from others of a like character), and "such parts or combinations as we claim to be our "invention, and for which we desire an exclusive privi- "lege for fourteen years, to be secured to us by letters "patent. Most persons who travel by railroad experi- "ence a continual repetition of sudden jars or shocks, "arising from the *sideway movement* of the flanches of "the wheels of the car against the rails of the track. "And so extensive are the evils of these frequent shocks "that, besides being greatly to the discomfort of the "passengers, preventing them almost entirely from read- "ing while traveling in this manner, it is highly injuri- "ous to the carriages, causing the joints and other parts "to become loose and soon deranged. The object of "our improvements is to *obviate the effects of the above* "*lateral motion* by springs suitably arranged, and which "we now proceed to explain." And in their claim, after stating their combination, they add: "The whole being "for the purpose of preventing the injurious and unpleas- "ant effects resulting to the car and passengers or goods "therein from the *sideway movement* of the flanches of "the wheels against the rails of the track, as herein- "before set forth." [Record, pages 64 and 67.]

Kipple & Bullock merely speak of the fact that their truck imparts "to the car an *easy* lateral movement as it "passes over curves and uneven portions of the track." [Record, page 69.]

In a locomotive it is impossible for the drivers to either swing or swivel, and the object of the Smith invention is to reach as near as possible to the condition in which the locomotive would be, could both truck-wheels and drivers swivel.

And it accomplishes this object by allowing the *truck* to follow the *track* by swiveling, and at the same time moving laterally under the body of the locomotive, while the driving wheels are kept nearly in their proper position (*i. e.*, as if free to *swivel*) by *not* being *twisted* across the rails by the truck, and by being gradually brought into the curve by the resistance of gravity to the outward swing.

The *sole* function of the swing truck in *cars* is entirely *secondary* in a locomotive, where instead of causing the locomotive to yield easily to side pushes (from irregularities in the track), it has all the tendency of the locomotive to move in a straight line to overcome, whenever a curve is reached, before it is in its *normal* condition for resisting side jolts.

It is plain, then, that not only is a new result obtained by the combination of a swinging and swiveling truck in a locomotive, but this result is something entirely different from the operation of the trucks of the same kind under a car.

Defendant's expert Waters agrees to this view. He says, "From the foregoing I think it is obvious that "there is nothing new in the machine described in "Smith's patent, as far as regards the truck itself in its "mode of operation. But there is another question in-"volved, viz: Is the locomotive of Smith new?

"Now, as compared with the common eight-wheeled "car fitted with the improvements of Kipple & Bullock, "I am inclined to think it is new, because the mode of "operation of the whole thing together, considered as a "unit, is different from the operation of an eight-wheeled "car, as a unit." [Record, page 60.]

And, in this connection, it is worthy of consideration that, notwithstanding the fact that although Bridges' truck, which contains substantially all that is contained in the Smith, or Kipple & Bullock truck, was patented in 1841, and went into extensive use under eight-wheeled cars, yet no one, until Smith commenced his experiments on the subject, ever had conceived the idea of the application of this truck under a locomotive.

As early as 1853, Smith had in his mind the conception of his invention, and discussed the question as to the proper mode of constructing engines both with Bridges and with Bissell, and though Bissell himself, in 1857, patented his invention, the possibility of accomplishing the result in the way in which Smith subsequently made his combination did not occur to him; and though Smith had the conception in his mind as early as 1853, and commenced to experiment as early as 1857 or 1858, and it was not until 1860 that he finally settled upon the combination for which he applied for letters patent in 1861.

The appellants have advanced an argument, more remarkable for ingenuity than soundness, to show that the invention of Smith is not an improvement but "a *serious* "*and harmful mistake* which has cost the appellants many "thousand dollars," and that therefore the combination of the truck with the locomotive is not patentable. [See pages 15, 16, and 17 of Appellant's Brief.]

This argument, as such, needs no refutation, but the references to the Master's report, the citation from the opinion of Mr. Justice Strong, and the extract from the evidence of Mr. Parry (which is said to "sum up the whole "matter") are so UNIFORMLY *incorrect* that it is proper to call the attention of the court to the TRUTH.

I cite from pages 16 and 17 of the Brief of Appellants.

"But it has been shown that the use of a swing truck

"with a locomotive is not an improvement on the use of "a fixed truck, but on the contrary, it is a very serious "and harmful mistake which has cost this appellant "many thousands of dollars (see Master's report and "Mr. Justice Strong's opinion, page 589, where he uses "the language following :—

"*There is no gain, profit, or advantage in the use of one "over the use of the other.*")

"Mr. Parry, one of the partners in the Baldwin Loco- "motive Works (perhaps the largest builders in the "world), sums up the whole matter very briefly on page "422.

"×Q. 25.—A. * * *I at one time thought it "(the swing truck) was an improvement like most other peo- "ple. 'Run in fashions, run in ruts,' they say.*

×Q. 26. *When was it changed?*

"A. *It was changed a good many years ago. I have "always regarded it as a means of helping to remedy a "wrong by making another wrong; that is, one wrong to "help another wrong to get it nearer right.*

"×Q. 27. DO YOU CONSIDER IT AN IMPROVEMENT OR "NOT?

"A. NOT AT ALL.

"×Q. 28. AN ENGINE EQUIPPED WITH A SWING-BOL- "STER TRUCK IS LESS PERFECT AS A MACHINE THAN ONE "WITHOUT A SWING-BOLSTER TRUCK?

"A. I THINK SO.

"An overwhelming preponderance of the witnesses ex- "amined agree with Mr. Parry in their estimate of the "utility of the swing-truck, and the opinion is made a "certainty by the experiments tried and exhibits put "in evidence. This subject is, however, so thoroughly "dealt with by the Master in his report, which contains

"references to the testimony, that it is unnecessary to go "more into details here."

These inaccuracies in the brief of appellants are easily corrected.

I. *The Master's Report.*

The Master, in fixing a basis of comparison for the estimation of profits, took an engine with a fixed truck and blind front drivers, and his conclusion was that such an engine is "as convenient, economical, and ser- "viceable for the traction of trains on tangents and "curves as an engine furnished with a swing-truck and "any kind of driving-wheels in use." [Record, page 144.]

On page 590 of the Record Mr. Justice Strong does use the words attributed to him, viz.:—

"There is no gain, profit, or advantage in the use of "one over the other;" but he, too, uses them in reference to the comparative merits of an engine with a rigid truck and *blind front drivers* and an engine with a swing-truck.

The sentence immediately preceding is as follows:— "The evidence certainly establishes that a locomotive "with plain forward driving wheels, that is, with forward "driving wheels without flanges and with a rigid truck, "is, in all respects, quite as convenient and economical "as is a locomotive with such a truck as the patents de- "scribe," [Record, page 590,] and then follows the sentence quoted by the appellants: "There is no gain, "profit, or advantage in the use of one over the use of "the other."

The comparison in both cases is between a *swing*-truck on a locomotive with *all* its drivers flanged and a *rigid*

truck on a locomotive having its front drivers *without flanges.*

The latter kind of locomotive may or may not be a better machine than the former; but neither the Master nor Mr. Justice Strong say that in the use of an engine with *all* its drivers flanged and equipped with a *swing*-truck, there is "no gain, profit, or advantage" over the *same* engine equipped with a *rigid* truck, and this is kind of engine the defendants used.

Mr. Parr, testified as he is quoted, but the quotation stops too soon. The next question and answer were as follows:—

×Q. 29. "Can you tell me about when you changed "your mind?

A. "Well, as I remarked, I always believed that a "plain tire on the front wheels of the drivers was a per- "fect engine. Then, in course of time, parties endeavored "to use two pair of drivers flanged, which made an en- "gine that was not free on the rail, that was not an "improvement, that was a detriment to the engine. Then "in order to maintain that detriment there was another "put on in itself about as bad (the swing truck); *but the "two together made the engine passable.* Therefore I "never had the opinion that the swing bolster truck with "double flanges was a perfect engine." [Record, page 422.]

Hill, a witness called by defendants, says, that a fixed centre truck will do as well, yet he is a little in favor of the Hudson improvement with radial bars. [Record, page 275.]

The Hudson improvement is the Bissell truck with a slot, in which the centre pin joining the two ends of the

radial bars can move, and thus make up for the lack of swivel in the king-bolt.

J. B. Collin, the mechanical engineer of the defendants' railroad, says, that while the Smith truck is of no benefit when the radius of curvature is over three hundred and fifty feet, yet with a radius of three hundred and fifty feet it would be a benefit. [Record, page 580, answer to cross-question 25.] And on the preceding page he mentions a curve on the Tyrone and Clearfield branch of defendants' road with a radius of *three hundred and thirty-one* feet.

The conduct of the defendants themselves affords the most conclusive evidence on this subject.

After the injunction was granted in this cause, the defendants moved to have it suspended, and upon the ground that it would be *dangerous* to discontinue the use of the swing truck, obtained an order suspending the injunction upon entering security in the sum of $40,000, which they did, and continued to use the Smith truck.

On March 9th, 1877, the evidence is that the defendants gave an order for the discontinuance of the swing truck as fast as the engines should be sent into the shop for repairs. [Record, page 586.]

On November 14th, 1877, out of seventy-eight engines with the swing truck on the Middle Division of the defendants' road, NINE only had been changed to rigid trucks, *nine* in *eight* months out of seventy-eight.

So much for want of utility in the Smith locomotive. It may be added that four thousand of the swing-truck engines had gone into actual use up to 1874. [Record, page 25.]

THIRD.

SMITH'S COMBINATION OF A TRUCK FREE TO SWING LATERALLY AND AT THE SAME TIME TO SWIVEL ON ITS KING-BOLT IS A DIFFERENT DEVICE FROM BISSELL'S COMBINATION OF HIS TRUCK WITH A LOCOMOTIVE, BECAUSE BISSELL'S TRUCK WAS NOT FREE EITHER TO SWIVEL ON ITS KING-BOLT OR MOVE LATERALLY UNDER THE BODY OF THE LOCOMOTIVE.

It will be necessary to examine Bissell's specification somewhat closely, in order to understand precisely what his combination was. The Bissell patent allows of a limited lateral motion of the truck beneath the front end of the locomotive; but, this lateral motion, while generally transverse, is really rotary around a centre midway, or slightly in front of a point midway between lines drawn between and at right angles to the axles of the drivers and the axles of the truck wheels; and the motion of the truck is in the arc of a circle of which this point midway, or nearly midway, between the drivers and the truck, is the centre. He uses, instead of the swinging bolster and links, a curved block sliding in a curved slot on the top of the truck frame, and the tendency to too great lateral motion was controlled by inclined planes fitting in the bottom of the slot, on which blocks fitted to the cross-bar surrounding the centre-pin moved. When the engine is on a straight line these blocks are on the lowest point of the inclined plane, and when the engine enters a curve, and the lateral motion begins, these blocks have to move up the incline, and, of course, the resistance to this motion by the inclines limits what would otherwise be the extent of the lateral swing. [Record, pages 112, 116.]

While this combination of Bissell's allows of a restricted lateral motion of the truck around a centre of motion outside of the truck somewhere between the axles of the drivers and the truck, it is described as being intended *to avoid allowing any swiveling motion around the king-bolt.* He says the object of his invention was:—

"To retain the truck with the axles always at right "angles to the rail, whether on a straight or on a curved "track, and prevent the truck swinging around on its "centre-pin in case of meeting any obstruction." [Record, page 112.]

Again, he says:—

"I construct my truck in such a manner that the axles "of the driving wheels shall be on the line of, or parallel "to, the radial line of the curve, so as always to have a "direct, forward, propelling motion, and not strain or "wear the rails or flanges of the wheels, so that two or "more pairs of the drivers can be fitted with flanges.

"The centre line of the locomotive, in going around "the curve, travels as a tangent to the centre of the "drivers.

"And to accommodate the curve I fit the truck, or for- "ward wheels, in such a manner as to allow of a trans- "verse motion, the said truck swinging laterally upon an "axis of motion 'h,' located centrally between the cen- "tre of the drivers and the truck (or slightly forward of "the same, so as to give *a slight tendency to the truck to "run to the inner side of the curved track*); thereby, the "axles of the truck wheels are parallel, or nearly so, to "the radial line of the curved rail, and the engine runs "around any given curve without much more strain, "either on the wheels or the track, than would occur on "a straight railroad, and, at the same time, *there is no "chance for the truck to turn on this centre-pin* by any ob- "struction coming in contact with the wheels; and the

"wheels will pass over a broken rail and not be displaced, "unless all four wheels are all simultaneously unsupported, "and even then the wheels and truck being correctly set "to the angular position with the drivers and curvature "of the track will continue to move in the correct direc- "tion, and pass over any obstacle and broken rail, and "maintain the uninjured part of the track." [Record, page 113.]

He points out that one of the dangers to be avoided is:—

"When the truck *swivels around on its centre-pin*, "throwing the locomotive off the track, greatly to the "injury of life and limb." [Record, page 113.]

Again he says:—

"In running on either a straight or a curved track, "one of the truck wheels often breaks off, and the truck "swivels around on its centre-pin, and, in consequence, "throws the engine off the track; but with my device "one wheel or even the two wheels on the opposite sides "diagonally of the truck might break off, and still the "truck would not run off the track, because *its position*, "*relatively to the body of the locomotive, is firmly main-* "*tained*." [Record, page 114.]

Again, in speaking of the centre-pin, he says:—

"Which, in my arrangement, changes its character "from a centre of motion simply to that of a draft-block "or pin." [Record, page 114.]

He also says that the block "K" may be bolted directly to the under side of the engine. [Record, page 114.]

These extracts, taken from Bissell's specification, show very clearly that whatever else he had in his mind, he had this idea distinctly, that there was to be no swiveling motion about the king-bolt; that any motion of the truck which was to take place in his combination was a motion around a point placed at the centre or near the centre of

a line drawn from the middle of the truck frame to a point midway between the axles of the drivers. It is apparent that any swiveling motion around the king-bolt would be impossible in the Bissell truck, because the truck being rigidly attached to the extremity of the two bars extending to a point behind the trucks where they are both pivoted at their other ends, and around which the truck moves as a centre of motion, it would be impossible for this truck, thus rigidly attached to the end of these radius bars, to have also a swiveling or rotating motion around the king-bolt, without at once breaking one or both of the bars.

In the Bissell locomotive, therefore, the combination differs mechanically from the combination in the Smith locomotive, which allows a free swiveling motion to the king-bolt.

The appellants have put forward the argument, not before advanced in this case, that the second claim of the Bissell covers *broadly the combination of a locomotive engine with a laterally moving truck.*

The answer to the position is plain :—

1. Bissell, after excluding certain modes of attaching trucks to locomotives, says:—"But in my case, the truck "having four or more wheels, acts as a lever to bring the "body of the engine into the correct position with the "track, because the flanges of the two or more pairs of "truck wheels coming into the straight or curved line "relative with the driver or drivers, can not do so with-"out the centre 'h' being in the correct position relatively "with said wheels and insuring the correct position of "the body relatively with the wheels." [Record, page 115.]

This description shows conclusively that the only mode of attachment Bissell had in his mind was at the centre 'h' which is a centre of motion outside of the truck. Again, the second claim is for a combination of inclined

planes or their equivalents in a truck having a lateral motion under the locomotive engine, "THE WHOLE *constructed and acting substantially as and for the purposes specified*," that is to say, rotating about a centre 'h' between the truck and drivers. And the reason for the second claim was that the first claim omitted any reference to inclined planes or their equivalents, which are necessary to restore the truck to its normal position.

The appellants say (see their brief, page 24) that both Smith & Bissell connect their trucks to the engine in the same way and in the same place. This is not correct. Smith's king-bolt fits in a bolster free to swing laterally. Bissell, when he uses a king-bolt, uses it as a substitute for a curved block sliding in a curved slot, which is the arc of a circle whose centre is 'h,' a point outside of this truck.

The appellants say that Smith & Bissell describe the result of their combination in the same way (their brief, page 25). In the *material* point of difference between them, *i. e.*, their operation in entering upon and leaving a curve, while Smith's patent explains the advantage of his combination [Record, page 30], Bissell says nothing.

The appellants seek to enforce their new contention that Bissell made two inventions, one of which was the combination in a locomotive of *any* laterally moving truck by endeavoring to analyze his specification so as to show that radius bars were not essential to the operation of Bissell's truck.

Even if the radial bars were removed Bissell's truck could not swivel on its king-bolt (if it should have one), because the truck in Bissell's combination slides across the king-bolt in a curved slot which forms the arc of a

circle, whose centre is the point 'h,' outside of the truck. [Record, page 114.]

On page 33 of brief of appellants it is stated that—

"*The radial bars were thought by railroad men a more valuable device than the lateral moving truck without them.*"

And appellee's witness Heden is quoted. The appellants again have forgotten to give the qualification of what they quote contained in the next preceding answer of the same witness, who says in answer 33 [Record, page 163]:—

"I refer to all those" (*i. e.* trucks) "built and furnished "this line after the adoption of the LOOSE radius bar— "more particularly after that than before * * * "but the difference in truck boxes is considerable be- "tween the *fixed* and the *loose* radius bars."

Another inaccuracy of the appellants may be here noted. On page 45 of their brief they say that not one of *appellees'* witnesses pretends that the use or non-use of radial bars makes any difference in the motion of the truck, and cites the names of several witnesses and refers to their testimony in the Record by page. Not one of these witnesses says anything *pro* or *con* on the subject, nor was one of them talking about the matter. While it is true they did not pretend to say anything, the inference *insinuated,* that they believed there was no difference, is without foundation.

On page 47 it is asserted that the radius bars were extensively and successfully used. The only use spoken of is by Heden, and that was with a *loose* radius bar. The loose radius bar, it may be stated [though not in the record], was the Hudson improvement of 1864, in which

the ends of the two radius bars moved in a slot about the point 'h,' thus compensating for the liability of the truck to swivel on *its own centre.*

To return now to a comparison of the Bissell and Smith combinations. There is not only the difference in the mechanical construction already explained, but there is a difference in the results which flow from this difference in structure. As I have shown already, in the Smith locomotive, either on a curve or in entering or leaving a curve, and particularly on leaving one curve and entering a reverse curve, by the operation of the Smith combination, which allows the trucks freedom of swiveling, so that their position is entirely controlled by the track, and which, at the same time, allows the drivers by a lateral motion of the truck under the front end of the engine to maintain the position of their flanges tangential to the line of the curvature, the locomotive is, as a whole, both as to its driving wheels and its truck wheels maintained and preserved in the correct and best position in which it can be placed to avoid friction and insure safety. The same results do not follow with the Bissell truck; and just here it may be well to note that while the Smith truck has come into very general and practical use on the defendants' road, the Bissell truck does not appear to have been practically used to any considerable extent.

The Bissell combination is successful in securing a correct position for the driving and truck wheels on the track only when a locomotive is either on a straight line, or on a curve of a uniform radius. Either on entering a curve from a straight line, or leaving a curve from a straight line, or passing from a curve into a reverse curve, this combination, or device, does not leave the axles of the drivers in a line radial to the curve, nor does it leave the truck wheels free to take a position controlled en-

tirely by the track. It can be shown, mathematically, that in the Bissell locomotive, when the flanges of the driving wheels are tangential to the curve and the truck wheels also tangential to the same curve, these tangents produced will meet and be equal in length, and that therefore the point of meeting must be midway between the centre line of the driving axles and the centre line of the truck wheels. These tangents only can be equal where they are the tangents of the same curve. Consequently, on entering a curve, or leaving a curve, where a tangent drawn through the flanges of the drivers will not be a tangent of the same curve as a tangent drawn through the flanges of the truck wheels, the point of meeting of these two tangents produced will not be a centre point between the driving axles and the truck wheels. Where the truck wheels are passing into a reverse curve, while the drivers are on a curve, a tangent to the line of curve on which the drivers rest will not meet a tangent to the line of the curve in which the truck wheels are, and, consequently, there is no point at all between the drivers and the truck around which the truck can rotate, and yet maintain its position tangential to the curve.

This is, in effect, admitted by the defendants' expert, William C. Hibbard, who says, on cross-examination :—

"The radius bars are not adapted to the condition of the machine when partly upon a curve and partly upon a straight line; but to the condition of the machine either entirely on a straight line or upon a curve."

So that Bissell's device, in reality, only met part of the difficulty which was to be overcome. It was only applicable to certain conditions, when the locomotive was either upon a straight line or upon a curve; but in passing from a straight line to a curve, or from a curve to a straight line, it was devised so that the results which he sought to reach were impossible to be reached, without a change in the position of the point around which his truck rotated, which change, if it were made to meet

the exigency of passing in or out of a curve, would leave it in an improper place when on a uniform curve or a straight line.

FOURTH.

THERE WAS NO SUCH PUBLIC USE OF SMITH'S INVENTION AS AMOUNTED TO AN ABANDONMENT TO THE PUBLIC.

This assignment of error is not noticed in the brief of ths appellants and is, I presume, *abandoned.*

The facts are briefly as follows :—

The only public use by Smith more than two years before the date of his application for a patent that is shown, is the use of the first locomotive that was built on the Hudson River Railroad in 1858, but both Smith and Buchanan testify that this was an experimental engine, and from the results of that experiment they made changes before Smith finally settled upon the form for which he ultimately applied for letters patent, and it must be borne in mind that from the nature of the machine an experimental use had to be made in public. A locomotive can not be run in a room, and if you make an experiment with it at all, you must experiment with it in public. But that is not certainly such an abandonment to the public as is contemplated by the patent act. (Elizabeth *vs.* Nicholson Pavement Company, 97 U. S., 126.) The only other public use that is testified to is a public use on the Old Colony Railroad, just a little more, a few months more, than the two years prior to Smith's application, and it is not shown that Smith had any knowledge of it, or much less, that he ever consented to it, so that such use can not be a public use for more than two years prior to his application, with his knowledge and consent.

FIFTH.

THE APPELLEES HAVE ESTABLISHED A LICENSE FEE OF ONE HUNDRED DOLLARS FOR EACH ENGINE EMBODYING THE SMITH INVENTION.

The evidence on this subject is as follows:—

Miller F. Moore, the secretary of the company complainant, testifies (page 25 Record) in substance: That in 1874 [the time when he was speaking] there were four thousand locomotives with the Smith truck; that there were sixteen locomotive builders in the United States, of which twelve had taken licenses under the Smith patent, and of these twelve, eleven had refused to continue paying since the defense set up in this suit. That from two hundred to three hundred engines are produced annually using the Smith patent, and that in Erie Railway suit he settled at about seventy-five dollars per engine.

The same witness says again (Record, 178):—

"Q. 6. You have collected a large number of royalties "upon this patent, have you not?

"A. Yes, sir.

"Q. 7. What royalties have you collected—what is "the amount? I do not mean the aggregate, but the "amount per engine.

"A. Licenses are made at the rate of one hundred dol- "lars per engine; and to railroad companies our prices "are invariably one hundred dollars. I know of no "single exception. But as we considered it to be judi- "cious management in the introduction of this improve- "ment, we have interested the locomotive builders in "our behalf, not only as an interest to them, but as an "assistance to us. We give them a discount of twenty- "five per cent. from our usual royalty for the purpose of "introducing our invention to the railroad community, "and to assist us in collecting our royalties. They

"build these locomotives for the different railroad cor-
"porations in the country, and send them to all parts of
"the Union, and out of the country; and it would be a
"difficult and expensive matter for us to hold the railroads
"accountable for the royalty on the engines manufac-
"tured. In many cases it would cost us more than the
"royalty due to collect the royalty of one hundred dol-
"lars per engine; and so we arrange with the engine
"builders to settle with us according to the collections
"they make, less twenty-five per cent."

And on cross-examination he says that the settlement of the Erie Railway suit was at between seventy-four dollars and seventy-five dollars per engine. Again he says (Record, pages 204, 205, and 206):—

"Miller F. Moore, a witness recalled by the complain-
"ant, testifies as follows:—

"By MR. HOLLINGSWORTH:

"Q. 1. About how many locomotives with the swing
"truck have the complainants' company sold?

"A. Do you want those embraced in the settlement
"with the Western Railroad Association?

"Q. 2. You can name those, and then give the num-
"ber other than those.

"A. There were somewheres in the neighborhood of
"twenty-three hundred in all. There were about eight
"hundred in the Western Railroad Association.

"Q. 3. About how much royalty did you receive for
"those sold to the Western Railroad Association, and
"what were the circumstances connected with the re-
"ceipt of that royalty?

"A. In the settlement with the Western Railroad As-
"sociation they made a proposition to give us thirty dol-
"lars an engine for all they had at the time the proposition
"was made, and to give us fifty dollars for each addi-
"tional engine they should thereafter put in use. That
"was the proposition of the Western Railroad Associa-
"tion, and our people thought that was a settlement

"which it would be pretty advantageous to make, as it "involved a settlement with about twenty-five of the "principal roads in the West, any one of which was in "condition and position to defend any suit we might "bring against them, and they making this proposition "to us we thought it advisable to accept.

"Q. 4. Leaving those settled for with the Western "Railroad Association out of the case, you have sold "about how many other engines?

"A. We have sold about fifteen hundred.

"Q. 5. About what average price have you received "for them?

"A. We have received about seventy dollars and a "fraction over, between seventy and seventy-one dollars "apiece; between seventy and seventy-one dollars.

"Q. 6. What are you charging manufacturers for "those engines now?

"A. Since the depression of business came on we have "reduced our royalty from seventy-five dollars to fifty "dollars an engine.

"Q. 7. How much had you been charging before that "time?

"A. Seventy-five dollars.

"Q. 8. What do you charge railroad companies?

"A. We charged railroad companies one hundred "dollars. Seventy-five dollars to railroad builders was "the net of one hundred dollars less twenty-five per cent. "commission which we gave to locomotive builders in "order that they might assume the payment of the royalty. "The plan previously had been that when locomotive "builders had built locomotives for the railroads we "assumed the collection of the royalty; but it necessi- "tated a great deal of expense and time, as the engines "went all over the country, and we thought it would be "economy on the part of our management to allow the "locomotive builders a discount of twenty-five per cent. "and collect our royalty from them, and they make re-

"ports to us monthly, or quarterly, or semi-annually, as "it was most convenient for them to do.

"Q. 9. You say the average price for your fifteen "hundred locomotives was only seventy dollars and a "fraction, when you charged at that time, until the de- "pression in business, seventy-five dollars to builders, "and one hundred dollars to companies; explain how it "was, therefore, that your fifteen hundred locomotives "only netted you seventy dollars and a fraction?

"A. That was in consequence of two reasons, one of "which was that previous to the organization of the Lo- "comotive Engine Safety Truck Company some of these "patents were owned by Levi Bissell and others, and they "had entered into a contract with the Rogers Locomotive "Works, giving them the right to manufacture and use the "improvements for fifty-five dollars an engine, and when "the company was organized, it assumed this contract "that was made by Bissell and others, and carried it out. "The Rogers Locomotive Works have constructed "a very large proportion of engines with the swing "truck, and they have paid our people somewhere about "$34,000. That embraces a very large proportion of "the whole amount of our business, and then when the lo- "comotive builders began to build what is now termed the "narrow-gauge engines, that is, of a gauge less than four "feet eight and a half inches, the price for those engines "was only about two-thirds what it was for a full-gauge "engine, and the locomotive builders thought it was a "hardship to pay the same royalty on those narrow- "gauge engines which they did on the full-gauge en- "gine, and to meet their views we reduced the royalty "on the narrow-gauge engine to fifty dollars, not wishing "to have anybody think that it was a hardship to use "this patent. There have been a great many of those "narrow-gauge engines built; how many I do not know, "because I never kept any account of this class sepa- "rately."

Take this evidence all together and it amounts to this, that the price charged as a license fee to railroad companies was always one hundred dollars for the class of engines on which the appellants have used the invention.

When suits were *compromised*, *not* brought to the court of last resort, less was taken, and where sales were made through locomotive builders, they were allowed a commission of 25 per cent.

It proves, moreover, that prior to April, 1874, *twelve* out of *sixteen* locomotive builders had taken a license from the company complainant, and that *eleven* of these *twelve* had refused to pay in consequence of the refusal of the defendants to pay anything. [Record, page 24.]

It shows that out of two hundred and thirteen engines on the Erie Railroad the license fee on one hundred and fifty-nine had been paid by locomotive builders.

It shows further that the company complainant had *received* up to September, 1876, on fifteen hundred locomotives an average price of between seventy dollars and seventy-one dollars apiece. [Record, page 205.] Of this amount about $34,000 had been received from the Rogers Locomotive Company, at the rate of fifty-five dollars per engine, under an old contract. Fifteen hundred engines at seventy dollars and fifty cents makes the total amount received $105,750; deduct from this amount $34,000, and it leaves $71,750.

Fifty-five dollars, the price of one engine, multiplied by six hundred and eighteen makes $34,000, the amount paid the Rogers Locomotive Company. Deduct this number of engines, six hundred and eighteen, from fifteen hundred, and we have eight hundred and eighty-two engines, for which the complainants received $71,750, or an average license fee per engine of eighty-one dollars and a fraction. Many of these license fees were collected through locomotive builders who only paid seventy-five dollars on the ordinary guage and fifty dollars on the

narrow guage roads. [Record, page 206.] So that on many locomotives there was received a license fee of much over eighty dollars. The witness Moore is there shown to be corroborated by the figures. He is also corroborated by the witness Blackall, superintendent of machinery on the Delaware and Hudson Railroad.

His evidence is on page 187 of Record. It is as follows:—

"Q. What royalty has your company paid on those "swing-truck engines?

"A. We have paid on what we put on ourselves $100; "but the locomotives we have, made by Danforth & Cooke, "and Dickson Manufacturing Company, they paid for. "What they paid I don't know."

On page 186, Record, the same witness says that they had seventy-four swing-truck engines on their road out of one hundred and four engines, and had sold four (4) swing-truck engines.

This is all the evidence in the case.

It establishes beyond contradiction the license fee to manufacturers at seventy five dollars. And while it does not specify the number of engines sold to railroad companies, it is clear that whatever the number was the license fee was always $100.

It is said, however, that inasmuch as the license covered six (6) inventions (one of which itself sold at fifty-five dollars per engine) the fee must be divided by six. If all the inventions could be used *at the same time* on *one* locomotive this would be reasonable.

But physically this is impossible, and contractually the license being in the alternative, it would be unlawful. The Bissell truck and the Smith can not be used together on the same locomotive, nor can the Hudson inventions, one of which is an improvement on the Bissell, and the other only applicable to engines to which the Smith invention is not applicable.

The rule which apportions the license fee, has no application at any time when, as in the present case, the license only authorizes the use of *one* of the *several* patents which it includes.

SIXTH.

THE ALLOWANCE OF INTEREST ON THE DAMAGES IS PROPER.

The amount of the damages was liquidated prior to the time the defendants began to infringe.

In cases of trover, replevin, trespass interest on the value of the property is assessed by way of damages.

Parrott *vs.* Ice Co., 46 N. Y., 361;

Sedgwick on Damages, (sixth ed.), *page 491;

Andrews *vs.* Durant, 18 N. Y., 496.

In Alden's Appeal, 93 Pa. St., 182, on a bill for an account of ore taken in excess of an ore right, interest was allowed on the amount the ore sold for.

In conclusion we ask the affirmance of the decree.

EDMUND WETMORE,
S. S. HOLLINGSWORTH,
For Appellees.

The appellees print the opinions of Justices Strong and Blatchford as part of their argument.

In the Circuit Court

OF THE UNITED STATES, FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

THE LOCOMOTIVE ENGINE SAFETY TRUCK COMPANY

vs.

THE PENNSYLVANIA RAILROAD COMPANY.

STRONG, *J.*—It is indispensable at the outset of this case to have a clear apprehension of the device or improvement for which the patent was granted to Alba F. Smith—the patent which it is alleged the defendants have infringed. The invention is denominated by the patentee in his specification, "An Improvement in Trucks for Locomotive Engines," and in the description of the drawing he calls it a plan of his truck. His language is: "In the drawing I have represented *my* improved truck itself. The mode of applying the same to any ordinary locomotive engine, will be apparent to any competent mechanic, as *my* truck can be fitted in the place of those already constructed, or the same may be altered to include *my* improvement." But though this seems to indicate that in the mind of the patentee, the thing invented by him, or at least the principal thing, was an improvement in trucks, the state of the art when his alleged invention was made, as well as other parts of his specification, and his claim, make it quite clear that the patent must be construed as embracing nothing more than a combination,

or in other words, the employment in a locomotive engine of a truck for pilot wheels framed in the manner described, and capable of a specified operation. That constituent of the combination called a truck is particularly defined, its peculiarities are pointed out, and thereby it is distinguished from other trucks, which might have been, and some of which had been, used in locomotive engines. But the truck so described was an old device, I think well known, and in common use long before the Smith patent was granted. This has been established in my opinion beyond doubt, by the evidence relative to the state of the art.

In 1841 a patent was granted to Davenport & Bridges for an improvement in railway carriages, especially eight-wheel carriages, having two trucks, one at each end of the car, and each truck connecting a set of four wheels. The improvement consisted mainly in constructing each truck with a swinging bolster located centrally between the axles; upon this bolster the car rested, and was connected with it by a king-bolt passing through its centre. The bolster was sustained by pendent links at or near each end of it, suspended upon two iron bars resting on the truck-frame, and having their lower extremities connected. The link and the bolster sustained by them were thus allowed to swing transversely to the track, limited. however, in the extent of their play by springs set on each side of the king-bolt, at a suitable distance from it. The objects and effects of this device were to allow, in addition to free rotation of the truck around the king-bolt, a lateral movement of the truck under the car when running upon, into, or out of the curved track, or at other times, and also to relieve passengers in the cars from the sudden jars caused by the sideway movement of the flanges of the wheels against the track rails. This improved truck appears to have been applied extensively to eight-wheel cars, generally, if not always, at each end of

the car. It was, however, said in the specification of the patentees, that one of the truck-frames of such a car (an eight-wheel) might have their invention applied to it, but that when applied to two of them, at opposite ends of the car, there was a combined action of the two, which tended to straighten the line of draft in a train of cars when running on a curve of the railway.

It does not appear that any truck exactly like that described in the Davenport and Bridges patent was ever applied to a locomotive engine, or any car in which the driving or hindmost wheels are rigidly attached to the body of the car or engine, and are incapable of rotating under the body. Nor was the truck, in all respects, like the truck employed in the Smith combination, though it made a near approach to it. It was not essential to it that the pendent links should be divergent; but the truck was so constructed as to allow lateral motion, and swiveling on the king-bolt, and in the improvement subsequently made by Kipple & Bullock, for which a patent was granted to them on the 20th of December, 1859, divergency of the links was an essential part. In that improvement, while the swinging bolster and the pendent links were employed, as in the Davenport & Bridges invention, the side springs were dispensed with, and the links were constructed so as to diverge outward from the bars on which they were suspended. The links were thus fitted to restrain the lateral movement of the bolster, and, correspondingly, of the car resting upon it, whether the tendency was to move towards the right or the left, and to keep the car within the limits of the space over which the links were allowed to vibrate. The use of divergent links had also a tendency to bring back the superincumbent car to a central position between the wheels, for as one of the links became more inclined, the other necessarily assumed a more vertical position, thereby raising the end of the bolster next the outer rail of the track.

Thus, the car resting on the bolster was compelled by any lateral movement of the truck to move up an inclined plane, in a direction opposite to the lateral motion, and consequently its weight was ever forcing it downward towards the central line between the rails. This improved truck was undoubtedly the same, in all essential particulars, as that employed by Smith in his combination.

I think, also it has been proved in this case, that pilot trucks having beams, or bolsters swinging on links spread at the base, so that the lower ends pointed outwards, and swiveling on the centre king-bolt, had been made and used before even the Kipple & Bullock invention. They appear to have been used on both the Vermont Central Railroad and the New York and New Haven Railroad before May, 1852, and on the Connecticut River Railroad as early as July, 1856. It is, therefore, very evident that there is nothing in the truck employed by Smith that was originally invented by him; nothing for which a patent could have been legally granted to him.

But if there were, neither the truck as such, nor any improvement in it, is claimed in his specification as his invention. It is in effect disclaimed. Though he calls it *his* truck, and *his* improvement, evidently he means the truck, or improvement which he uses in his combination. His language is, "Several laterally moving trucks have heretofore been made and applied to railroad cars. My invention does not relate broadly to such laterally moving trucks, but my said invention consists in the employment, in a locomotive engine, of a truck or pilot wheel provided with pendent links to allow of a lateral movement, so that the driving wheels of a locomotive engine continue to move correctly on a curved track, in consequence of the lateral movement allowed by said pendent links, the forward part of the engine traveling on a tangent to the curve, while the axles of the drivers are parallel or nearly so to the radial link of the curve."

Such also, almost "*in totidem verbis*," is the language of the only claim made. It is true, the specification describes minutely the truck which the patentee calls his, with its swinging bolster, diverging pendent links and with its centre and elongated opening for the king-bolt, but in view of the other parts of the specification the description must be regarded as merely an identification of the peculiar truck which he proposed to employ in combination with a locomotive engine.

It must then be concluded, in view of the history of the art, and of the specification itself, that the invention patented to Smith was not a pilot truck having an improved construction, nor any improvement in a truck. Nor was it, I think, merely a combination of a truck with a locomotive engine, even though the truck should be capable of lateral movement; but it was the combination with or the employment in such an engine of a truck fitted with divergent pendent links to allow lateral motion, and having the properties and capacities of the peculiar truck described in the specification. Capability of lateral motion obtained through the agency of a swinging bolster and pendent links, or some equivalent therefor, was undoubtedly essential to the truck, but I think this was not all that was essential. The different devices described were intended to accomplish a purpose, which was declared to be to allow the drivers of the engine to remain correctly on the track, in consequence of the lateral motion of the truck, allowed for by the pendent links, when running on a curve as set forth. This is a part of the language of the claim, and in describing the operation of his improvement, the patentee says: "When running upon a straight road the engine preserves great steadiness, because any change of position transversely of the track, in consequence of the engine's moving over the truck, or the truck beneath the engine, is checked by

the weight of the engine hanging upon the links (o o), and in consequence of their divergence, any side movement causes the links on the side towards which the movement occurs to assume a more inclined position, while the other links come vertical, or nearly so; hence the weight of the engine acts with a leverage upon the most inclined links to bring them into the same angle as the others, greatly promoting the steadiness of the engine in running on a straight line. As the pilot or truck wheel enters a curve a sidewise movement is given to the truck, in consequence of the engine and drivers continuing to travel as a tangent to the curve of the track; this movement *and the slight turn of the whole truck upon the king-bolt* (*i*) not only causes the truck wheels to travel correctly on the track with their axles parallel to the radial line of the curve of the track, but also elevates the outer side of the engine, preventing any tendency to run off the track upon the outer side of the curve. Upon entering a straight track, the truck again assumes a central position, and in case of irregularity in the track, or any obstruction, the truck moves laterally, without disturbing the movement of the engine. From this it appears plainly, that the combination intended to produce the result desired, was of a locomotive engine with a pilot truck capable not only of lateral motion, but also of rotation around the king-bolt at its centre. Swiveling on that king-bolt, as well as lateral motion, was therefore of the essence of the invention. Such, I think, is the true and reasonable construction of the patent.

That the combination, if an original device of Smith, was patentable, can hardly admit of question. Conceding that the truck used by him was in all essential particulars old, that it was the same as the Davenport and Bridges truck, or that of Kipple and Bullock, it had never before been employed in a locomotive engine, unless so employed by Levi Bissell, to whose patent I shall presently

refer. It had been used under eight-wheeled passenger cars, and perhaps under eight-wheeled freight cars, but in all those both trucks were allowed to swivel freely on their centres around a king-bolt. When applied to a locomotive engine, or a car the hindmost wheels of which are rigid and can not swivel, while the operation of the truck is precisely like its operation when under a passenger car, a new effect upon the movement of the engine is produced. The drivers or rear wheels move on a curved track with less grinding or sliding, and the friction is greatly diminished. It is not then the case of a mere double use, nor the aggregation of two devices acting independent of each other, but the production of a new and useful result.

I come next to what appears to me the most important and difficult question in the case, in regard to which my mind has not been free from doubt. Was the combination described and claimed by Smith novel when invented by him? His patent is dated February 11th, 1862, and the application for the patent was made on the tenth day of July, 1861. The defendants contend that prior to both those dates, and before Smith had devised his combination, as patented to him, a combination substantially the same had been completed and brought into use by Levi Bissell, and they have given in evidence a patent granted to Bissell on the fourth day of August, 1857. That patent was surendered in 1864, and a reissue was granted to these complainants as assignees of Bissell, which of course must be regarded as a patent for the original invention. That invention, as described by the patentee, was, in substance, a combination with a locomotive engine of a pilot truck framed to allow lateral motion. Like the invention claimed by Smith, it was not the application to a locomotive of any kind of a pilot truck. The patentee particularly described the distinctive features of the truck he proposed for the

combination. While preserving capacity for lateral motion, he dispensed with a swinging bolster and pendent links, and substituted for them a curved sliding beam or block, sliding in a curved groove or slot in the top plate of the truck frame. The general direction of this slot was across the track, and the curve, both of the slot and of the sliding beam, corresponded with an arc of the circle, the centre of which was a fixed point behind the truck and slightly forward of the centre, between the drivers of the engine. This arrangement of the sliding beam in the curved slot admitted lateral motion of the truck under the locomotive, and the tendency to too great vibration of the engine on the truck was limited by inclined planes fitted in the bottom of the slot at each end, and fit block on the sliding beam surrounding the bolt, which passed through its centre. "The position of the inclines," said the specification, "is such that the blocks (*n n*) rest in the lowest part of the double inclines when the engine is on a straight track, and, on coming on a curve, the inertia of the engine (tending to move in a straight line and cause the truck flanges to mount the outer rail), is expended in going up the inclines (*o o*) as the truck moves laterally toward the inner part of the curve, and on coming on to a straight line, the blocks descend by gravity to the bottom of the inclines, and the engine is prevented by gravity from acquiring a sidewise or oscillating motion." Other devices were pointed out for attaining the same results, namely, the allowance of lateral motion, and at the same time making use of the weight of the engine, to restore it to its normal position, when the truck has been moved laterally under it.

I think the sliding beam, the blocks and the inclined planes may well be regarded as mechanical equivalents for the swinging bolster and the pendent links; certainly when the links are made to diverge. But there were other

features in the truck of Bissell which must be noticed. A primary object which he had in view was "to prevent the truck from swiveling around its centre in case of meeting with any obstructions." The patentee pointed out the difficulties and dangers attending the running of locomotive engines on curves with the pilot truck previously in use. His language was: "There is still a rigid straight line from the centre of the truck to the centre of the axle of each pair of drivers, and this can not be exactly in the centre line of the track which is curved. This fact contributes, with the tendency of the machine to move forward in a straight line, to push the truck outward. The truck is constantly by this means borne to the outer side of the curve, and the engine has a tendency to go off in the direction of the arrow" (in the drawing, *i. e.* beyond the outside of the curve), "particularly in case a broken rail or obstruction occurs, when the truck swivels around on its centre pin, throwing the locomotive off the track." He then proceeded to set forth how he proposed to remove these difficulties and dangers. "I construct my truck," said he, "in such a manner that the axles of the driving wheels shall be parallel to the radial line of the curve, passing through a point between them, so that the drivers have a direct forward propelling motion along the rails, and do not strain or wear the flanges, and so that two or more pairs of drivers can be fitted with flanges. The central line of the locomotive, in going around the curve, travels in a position tangential to the curve at a point between the drivers, and I fit the truck wheels in such a manner as to allow the truck a transverse motion. This is equivalent to a bending of the locomotive, the said truck swinging laterally upon an axis of motion (1) located centrally between the centre of the drivers and the centre of the truck (or slightly forward of the same, so as to give a slight tendency of the truck to run to the

inner side of the curved track)." He then detailed the effects which he claimed for his arrangement, and added, "*At the same time there is no chance for the truck to turn on its centre by any obstruction coming in contact with the wheels.*" The wheels will pass over a broken rail and not be displaced, unless all its wheels are simultaneously unsupported, and even then the truck, being set correctly in an angular position with the drivers, will continue to move in the correct direction, and will pass over any obstacle or broken rail, and attain the uninjured part of the track. In running on a straight track, the truck is held correctly in position, and will run over quite considerable obstructions without being turned aside. In running an ordinary engine on either a straight or curved track, one of the truck wheels sometimes breaks off, and the truck swivels around on its centre pin in consequence and throws the engine off the track. But with my invention one wheel, or even two wheels, on opposite sides of the truck, might break off, and still the truck would not run off the track, *because its position relatively to the body of the locomotive is firmly maintained.* And in his description of his drawings the patentee said of the centre pin (that is, the bolt connecting the engine with the sliding beam), "*It is the centre pin, which in my arrangement changes its character from a centre of motion to that of a draught block or pin, while the centre of motion is thrown back to the point (h), which is slightly forward of the centre, between the drivers.*" Once more, after reiterating some of the results of his arrangement, he said: "By reason of the above facts, and also of the further fact that I compel the truck to swivel around the centre (meaning the centre of motion in the rear of the truck frame) in proportion as the truck and the body move sidewise relatively to each other, I cause the angular position of the truck to conform to the conditions required on a curve, and also steady the truck in running both on curves and

straight lines, so that obstacles may be run over, and wheels or axles may fail, without allowing the truck to assume a false position."

I make but one other quotation from the specification. In describing his mode of attachment of the truck to the locomotive, he said: "The block (*k*), (that is, the curved block or beam, curved from the centre (*h*) and sliding in the curved slot), might be bolted directly to the under side of the engine, and the curved slot would bring the axles of the wheels (*e e*) parallel with the radial line, or nearly so; but to allow an easier motion to the parts, the said block (*k*) may be prevented from turning by radius bars (*i*) to the centre (*h*). I, however, prefer that said radius bars (*i*) should be attached at (3.3) to the frame, so as to cause the truck to swing on the centre (*h*), in which case the block (*k*) may be made use of, or the pin (king-bolt) be fitted to move in a curved slot, as shown in the drawing."

I have made these large extracts from Bissell's specification in order to show, what I think in view of them must be apparent, that whatever use he may have planned, it was essential to his invention that his truck, when in combination with a locomotive engine, should be incapable of swiveling on a king-bolt at the centre of the truck or within its frame. Such undoubtedly was his purpose, and that purpose his devices, I think, fully accomplished. Whether the locomotive was attached to the truck by being bolted rigidly to the curved block, or sliding beam or bolster, which was compelled to move in a curved slot, of which the point (*h*) behind the truck frame was the centre, or whether the block was prevented from turning by the radius bars holding it to that centre, or whether the radius bars were attached to the truck frame, it seems to me that rotation of the truck around any bolt or point at its own centre or within its frame was rendered impossible. The truck in its entirety had a centre

of rotation at the point (*h*), and that there can be but one centre of rotation to one body is confessedly true.

A very earnest and ingenious argument has been addressed to me, and enforced by the exhibition of drawings and a model in order to convince me that in fact the combination of Bissell did allow some swiveling of the truck around the bolt through the sliding beam. I have given to the argument, the drawing, and the model, careful consideration, but I have not been convinced by them. There is a change of position of the bolt, as there is of the block through which it passes when the block slides in the curved slot, or groove, for the bolt slides with the block, but the block does not rotate around the bolt, and therefore the truck of which the block is a part can not. It is true, the bolt might be forced to turn very slightly on its own axis, as it is in the model exhibited to me, and thus give an apparent slight rotation of the truck around the bolt.

This might be done by carrying the bolt through the curved block and the curved groove or slot, and then attaching its lower end to another slide below the groove in the cross plate, the under slide being constructed to move directly across the frame, in a rectangular slot, instead of a curved one corresponding with the slot above it. The swiveling even then would be almost imperceptible. But such was not Bissell's arrangement. He devised another centre of rotating motion for the entire truck, and gave no intimation that his arrangement permitted the truck to swivel around two centres of rotation.

The result of this examination of Bissell's patent, then, must be the conclusion that his invention was the combination with a locomotive engine of a pilot truck fitted to allow lateral motion, but incapable, when in combination with the engine, of swiveling on a king-bolt at its centre. Place now side by side with this the Smith invention, and to my mind it becomes plain that the com-

binations of the two inventors were substantially different. As has been seen, Smith's was the combination of a locomotive with a truck capable not only of lateral motion, but also of free rotation around the king-bolt at its centre. Lateral motion was common to both, but free swiveling around a centre within the frame of the truck was essential to one, while the impossibility of it was essential to the other. Practically, therefore, the elements of the two combinations were not the same. The operations of the trucks were unlike when they were brought into combination with the engines, and in such combination, they may well be regarded essentially different trucks.

And not only so, but different results were obtained from the combinations alike in the working of the trucks and of the locomotives, as well as in their concurrent actions. While traveling upon a slight track, or on a curve the radius of which is constant or invariable, there is no appreciable difference in the working of the Bissell and the Smith arrangements. But when the locomotive is on a straight track and the pilot truck is on a curve, or *vice versa*, or in passing from one curve into a reserve curve, there is a very important difference, for in either of the three cases last mentioned, the position and the direction of the truck axles depend, in Bissell's combination, upon the position of the pin in the rear of the frame of the truck, which is made by him the centre of rotation, and the position of that pin is controlled by the locomotive.

Necessarily, therefore, his truck wheels are twisted on the track by the drivers acting through that pin and the radius bars, or through the curved block moving in the curved slot around the pin as a centre. On the other hand, Smith's truck wheels are never twisted on the track, for the track alone controls their position and the direction of their axles. Swiveling as the truck does on its own central king-bolt, the axles and wheels

are unaffected by the direction of the longitudinal centre line of the engine's motion. Of course they assume a correct position, and with the lateral movement, allow the drivers to remain correctly on the track.

I dwell no longer upon this part of the case. I have said enough to show that the truck employed by Smith is, when in combination with a locomotive engine, a substantially different truck from that employed by Bissell; that its mode of operation is different, and that a new and useful result is obtained thereby. And if so, it follows, that the patent granted to Smith is not invalid for want of novelty in the invention. The combination is not claimed to have been anticipated by any other than Bissell.

I come now to the consideration of another objection to the Smith patent which was elaborately urged during the argument. It is that the invention was abandoned by the patentee; or permitted by him to be in public use more than two years before his application for a patent. This is, in fact, a double objection, but it may well be considered as one.

It appears from the testimony of Smith himself that in the year 1853, when in New York, he went on one occasion with a Mr. Bridges and Mr. Bissell, to the rotunda of the Merchants' Exchange, to examine a contrivance exhibited there, for preventing the disastrous effects of the breaking of railroad axles. In the rotunda they found a complete model, on a small scale, of a railroad car, and of a track having a curve and a reverse curve, with the novel invention attached, to show the operation. While there, Smith took occasion, having permission from the owner of the model, to illustrate his views of the proper construction of locomotives, having swiveling trucks with swinging bolsters. What his views were the evidence does not show. But this testimony, it has been argued, is proof

that he then dedicated or surrendered his invention to the public. I can not think so. I can not see that it shows he then had any complete conception of the invention for which he subsequently obtained his patent, and if he had, the conception was not embodied. For aught that appears, his idea may have involved some changes in the locomotive itself—some new mode of construction to adapt it to the use of swiveling trucks with swinging bolsters. He may then have contemplated a truck swiveling on a centre outside of its frame, like the one which Bissell subsequently employed. And whatever his view may have been, very clearly it was not a perfected invention which could then have been patented, and consequently there was no invention capable of abandonment. I think it would be going unwarrantably far were I to hold that what took place at the Merchants' Exchange amounted to a dedication to public use of the invention which he claimed in 1861, and for which he received a patent.

There is, however, other evidence upon which the defendants rely to establish their allegation of abandonment. According to Smith's testimony, the history of his invention was this: In 1856 he was General Superintendent of the Hudson River Railroad, and in the fall of that year, or early in 1857, he described his truck to Mr. Buchanan, who was then the master machinist of the road, and illustrated its operation by chalk sketches. At that time, at his suggestion, and under his direction, an engine with the truck was constructed. It was completed on the sixteenth day of September, 1858, was put upon the road and tried. Manifestly it was an experimental thing. Neither Smith nor Buchanan had full confidence in it. It was first tested without a train, and then with freight and slow passenger trains. These trials seem to have suggested the modifications, and two other engines were constructed in another shop of the company, and

delivered in July, 1860. Into these several changes were introduced, suggested by observation of the working of the first. Two other engines were built and delivered in the spring of 1861, in which other changes were made, and it was not until their construction that the invention was considered perfected. Very soon afterwards the application was made for a patent. Such is the testimony of Smith, and it is fully confirmed by that of Buchanan. There is a little conflict in the testimony respecting the time when the first engine was constructed. I do not regard it as of importance. It is impossible to see in all this evidence of abandonment. It was correctly said by Justice Clifford, in Jones *vs.* Sewall (3 Vol. Patent Office Official Gazette, 1873, p. 630), to be settled law that the mere forbearance to apply for a patent during the progress of experiments, and until the party has perfected his invention, and tested its value by actual practice, affords no just grounds for presuming an abandonment (Kendal *vs.* Winsor, 21 How., 328. Agawaw Comp'y *vs.* Jordan, 7 Wall., 607). It is true an express relinquishment of an invention to the public is not indispensable to an abandonment. It may be inferred from long delays unexplained, or from acts of the inventor inconsistent with any other theory, but it can not be presumed from mere delay to apply for a patent when the inventor is all the while perfecting the invention and testing its merits.

Nor has it any bearing upon the case that Smith's experiments were made in public, and that his experimental engines were run upon a railroad, that it was a public highway. Thus only could the invention be tested. There is an obvious distinction between a public use or an use by the public, and an experimental use in public. In many cases it has been decided that a use in public for test or experiment is not such a public use as was contemplated by the act of Congress, nor such a use as can

be held evidence of dedication to the public. The Nicholson pavement case was notably one.

It has not been contended, and certainly in view of the evidence it ought not to be, that the Smith invention was in public use or on sale with his consent, more than two years prior to his application for a patent. It appears to have been used on the Old Colony Railroad in April, 1859, but there is nothing to show that such use was allowed by Smith, or that he knew of it.

My conclusions then, upon the whole case, are as follows:—

1. The combination claimed by Alba F. Smith, and described in his specification, was a patentable invention.

2. The patent granted to him on the eleventh day of February, 1862, is not void for want of novelty of the invention. The invention had not been anticipated.

3. There is no sufficient evidence that the patentee abandoned the invention.

4. The patent is not invalid because the invention was in public use, or on sale, with the allowance of the inventor, more than two years before his application for the patent.

The only question that remains is whether the defendants have been guilty of infringement. In regard to this there is no controversy. An infringement is very clearly proved; I shall, therefore, order the injunction prayed for in the bill, and decree an account, &c.

Let a decree be prepared accordingly.

Circuit Court

OF THE UNITED STATES FOR THE SOUTHERN DISTRICT OF NEW YORK.

THE LOCOMOTIVE ENGINE SAFETY TRUCK COMPANY

vs.

THE ERIE RAILWAY COMPANY.

December 30th, 1872.

BLATCHFORD, J.: This suit is founded on letters patent granted to Alba F. Smith, February 11th, 1862, for an "improvement in trucks for locomotives." The specification describes the invention as an "improvement in trucks for locomotive engines." It says: "Several laterally moving trucks have been made and applied to railroad cars. My invention does not relate broadly to such laterally moving trucks, but my said invention consists in the employment, in a locomotive engine, of a truck or pilot wheels, provided with pendent links, to allow of a lateral movement, so that the driving wheels of the locomotive engine continue to move correctly on a curved track, in consequence of the lateral movement allowed to said pendent links, the forward part of the engine traveling as a tangent to the curve, while the axles of the drivers are parallel, or nearly so, to the radial line of curve. In the drawing, I have represented my improved truck itself. The mode of applying the same to any ordinary locomotive engine

will be apparent to any competent mechanic, as my truck can be fitted in the place of those already constructed, or the same may be altered to include my improvement." The truck has four wheels, on two axles, and a frame made in the usual manner of the frame of an ordinary locomotive truck. It has a centre cross bearing plate or platform, made of two thicknesses of iron-plate, riveted together, and embracing the upper bars of the frame; and a bolster, made of a flanged bar, through a hole in the centre of which the king-bolt passes. The king-bolt also goes through an elongated opening in the bearing plate, to allow a lateral motion to the truck beneath the bolster. At the same time, the king-bolt is a connection, to hold the truck to the engine. The bolster takes the weight of the engine in the middle, and is itself suspended at the ends of bars attached to the moving ends of pendent links, which are attached by bolts, at their upper ends, to brackets on the frame. The distance between the bars, transversely of the truck, is slightly more than that between the bolts, so that the pendent links diverge slightly. The specification says: "When running upon a straight road, the engine preserves great steadiness, because any change of position, transversely of the track, in consequence of the engine moving over the truck, or the truck beneath the engine, is checked by the weight of the engine hanging upon the links, and, in consequence of their divergence, any side movement causes the links on the side towards which the movement occurs, to assume a more inclined position, while the other links come vertical, or nearly so. Hence, the weight of the engine acts with a leverage upon the most inclined links, to bring them into the same angle as the others, greatly promoting the steadiness of the engine in running in a straight line. As the pilot or truck wheels enter a curve, a sidewise movement is given to the truck, in consequence of the engine and drivers

continuing to travel as a trangent to the curve of track. This movement and the slight turn of the whole truck on the king-bolt, not only causes the truck wheels to travel correctly on the track, with their axles parallel to the radial line of the curve of track, but also elevates the outer side of the engine, preventing any tendency to run off the track upon the outer side of the curve. Upon entering a straight track, the truck again assumes the central position, and, in case of irregularity in the track, or any obstruction, the truck moves laterally, without disturbing the movement of the engine. I do not claim laterally moving trucks, nor pendent links, separately considered." The claim is: "The employment, in a locomotive engine, of a truck or pilot wheels, fitted with the pendent links, *o*, *o*, to allow of lateral motion to the engine, as specified, whereby the drivers of said engine are allowed to remain correctly on the track, in consequence of the lateral motion of the truck, allowed for by said pendent links, when running on a curve, as set forth."

The proof shows that the defendants have used, in this District, an engine built by them at Dunkirk, in the Northern District of this State, which has four flanged driving wheels, and contains the invention claimed in Smith's patent. The issue is as to the novelty of the invention. In order to determine this question, it is necessary to clearly see what invention is claimed in Smith's patent.

He does not claim laterally moving trucks, that is, trucks with laterally swinging bolsters. Nor does he claim pendent links, by themselves. Laterally moving trucks, applied to railroad cars, which had at each end one of such trucks, free also to swivel around a king-bolt, which connected the car to the truck and passed through the centre of the swinging holster, which was the centre of the truck, were old. The specification so

admits. But Smith's invention, as claimed, is for the use in, and the combination with, a locomotive engine (that is, a structure having at its rear end, not a swiveling truck, but non-swiveling driving wheels, with axles rigidly attached to the body of the engine), of a swiveling pilot or leading truck, provided with pendent links, to allow the forward part of the engine to move laterally over the truck, when the truck and the driving wheels are not together in a straight track, whereby the forward part of the engine can move onward in a line tangent to a curve, while the axles of the driving wheels are parallel, or nearly so, to the radial line of the curve, and the axles of the truck wheels also become parallel to the radial line of the curve, because the truck is made to swivel around the king-bolt by the action of the rails on the flanges of the truck wheels.

In going around a curve with a locomotive engine, the axles of the two pairs of driving wheels tend to assume a parallelism to that radius of the curve which is equidistant between the two axles. If the pilot truck has no lateral swing to its bolster, but merely swivels on the king-bolt, the tendency of the action of the truck wheels, on a curve, is to force the king-bolt into a position over the centre of the track. That action is resisted by the body of the engine, and, to accomplish it, the driving wheels must be twisted out of their proper position, and must slip and grind on the rails. The reason of this is, that a line drawn longitudinally through the centre of the engine, at right angles to that radius of the curve which is equidistant between the two axles of its driving wheels, will not strike the king-bolt at the centre of the track, unless the driving wheels are so caused to slip. Hence it was customary, with a pilot truck which only swiveled, and had no lateral swing to its bolster, to make the front driving wheels without flanges, so that they might slide sidewise. But the antagonism is reconciled by allowing

the king-bolt and the forward end of the engine to move laterally, so as to keep in a line substantially at right angles to the axles of the driving wheels, and outside of the centre of the track, the king-bolt being no longer controlled in its position by the truck, and there being no twisting of the driving wheels out of position.

Another feature, developed in the use of the pendent links, is pointed out in the specifications, which is, that, on entering a curve, the outside of the engine, as the truck moves inward laterally under it, is elevated, so as to counteract any tendency to run off of the track on the outside, by the centrifugal action, and, as the mode of hanging the links causes the link on the outer side to assume a more inclined position, while the other link becomes more nearly vertical, the weight of the elevated engine acts to steady the engine, and restore it to a position midway between the rails, on returning to a straight track. This feature of the links also acts to keep the engine steady when on a straight line.

The patent granted to Bridges and Davenport, May 7th, 1841, for an "improvement in railway carriages," shows a swinging bolster, in a truck swinging on a king-bolt, the body of the car being connected to the truck frame by pendulous links, from which such body is hung, whereby a lateral motion of the truck is permitted, independently of the body of the car, the sidewise motion being checked by springs in the truck. But the specification of that patent does not suggest the use of such a truck in any other structure than a car having one of such trucks at each end, and two king-bolts. Nor did it, or the use of two of such swinging bolsters in a car, suggest, from 1842 to 1862, the combination of such a swinging bolster truck with a locomotive engine, for the purposes set forth in Smith's specification.

In the truck described in Smith's specification, the side springs of Bridges and Davenport are dispensed with, the

divergence of the pendent links being used, instead, to check the sidewise movement. This precise construction of divergent links is shown in the patent granted to Kipple and Bullock, December 20th, 1859, for an "improvement in car trucks." Their use has the tendency to elevate the outside of the car on a curve, and the tendency to steady the body of the car through its weight on the links that are most inclined, and the tendency to limit the lateral movement, without using side springs. But, although the mode of operation of a Kipple and Bullock truck, *per se*, in a car having a like truck at its other end, is the same, for all the purposes of the truck itself, that it is in a structure which has driving wheels at the other end, yet, the moment the truck is swiveling on a king-bolt is taken out of the other end of the structure, and driving wheels take its place, the mode of operation of the structure, as a whole, becomes different from the mode of operation of the structure with the two swiveling trucks. This is conceded by the expert for the defendants, and is quite manifest. The mode of operation becomes such as is described in Smith's specification, and no such mode of operation exists in the structure with the two trucks. Moreover, the existence of the Kipple and Bullock patent, and the use of cars each with two of their trucks, does not seem to have suggested, before the invention of Smith, the use of one of such trucks as a pilot truck in a locomotive engine, to obviate the well-known difficulties in using the engine on a curve.

The only other pre-existing invention brought up to affect the novelty of the Smith invention, is the patent granted to Levi Bissell, August 4th, 1857, for an "improvement in trucks for locomotives." Bissell's truck is shown under the forward part of a locomotive engine. It has a provision designed to allow a lateral motion to the truck, independently of the motion of the body of the

engine, and a provision to cause the forward part of the engine to mount up an incline, towards the outer side, in a curve, and thus check the sidewise movement, and to descend, by its gravity, to the normal position, on resuming the straight track. The specification of Bissell's patent says that the object of his invention is "to retain the truck with the axles always at right angles to the rail, whether on a straight or curved track, and prevent the truck swinging around on its centre-pin, in case of meeting with any obstruction, and to make the curvature of the rail the means of turning the truck, so that the axles are parallel to the radial line of the given curve, in which position they are retained firmly until the direction of the track again changes." The specification then points out the difficulties in the use of locomotive engines on curves, with the ordinary pilot-truck, resulting in a "constant sidewise sliding motion on the rail," in consequence of the driving wheels being forced in a line deflected from that of a cylindrical forward rolling motion, and in a constant bearing of the truck to the outer side of the curve, and in the tendency of the engine to go off the track, "particularly in case a broken rail or obstruction occurs, when the truck swivels around on its centre-pin." It then proceeds: "I, therefore, construct my truck in such a manner that the axles of the driving wheels shall be on the line of, or parallel to, the radial line of the curve, so as always to have a direct forward propelling motion, and not strain or wear the rail or flanges of the wheels, and so that two or more pairs of drivers can be fitted with flanges. Consequently, the centre line of the locomotive, in going around a curve, travels as a tangent to the centre of the drivers, and, to accommodate the curve, I fit the truck or forward wheels in such a manner as to allow of a transverse motion, the said truck swinging laterally upon the axis of motion *h*,

located centrally between the centre of the drivers and truck (or slightly forward of the same), so as to give a slight tendency to the truck to run the inner side of the curved track. Thereby, the axles of the truck wheels are parallel (or nearly so) to the radial line of the curved rail, and the engine runs around any given curve without much more strain, either on the wheels or the track, than would occur on a straight railroad; and, at the same time, there is no chance for the truck to turn on its centre-pin by any obstruction coming in contact with the wheels, and the wheels will pass over a broken rail and not be displaced, unless all four wheels are simultaneously unsupported, and, even then, the wheels and truck, being set correctly to the angular position with the drivers and the curvature of the track, will continue to move in the correct direction, and pass over any obstacle or broken rail, and attain the uninjured part of the track; and in running on a straight track, the truck is held correctly in position, and will run over quite considerable obstruction without being turned aside. In running on either a straight or curved track, one of the truck wheels often breaks off, and the truck swivels around on its centre-pin in consequence, and throws the engine off the track; but, with my device, one wheel, or even the two wheels on the opposite sides, diagonally of the truck, might break off, and still the truck would not run off, because its position is set, and it has no axis of motion around which it would swing, when injured as above stated, or when meeting a broken rail or any obstruction, but is given a direct forward propulsion; and, in all cases, the axles of my wheels have only a strain and tension due to the difference of length between the outer and inner rails, instead of a strain due to the binding of the flanches of the wheels, from the diagonal position of the axles, in addition to the above-named strain; hence, axles so often break when running around a curve.

With my engine, the friction on the rails, in running around curves, is avoided, and I am enabled to maintain a nearly uniform speed without any unusual strain or wear on any parts." The specification of Bissell then describes the construction of his apparatus, with reference to drawings. It says, that the centre-pin (which is the king-bolt in the centre of the truck), in his arrangement, "changes its character, from a centre of motion, simply to that of a draft block or pin, while the centre of motion is thrown back to the point *h*, which is slightly forward of the centre between the drivers." There is at the centre of the truck a block, whose longest direction is across the track, and whose longest sides are parts of circles, of which *h* is the centre, or, as the specification expresses it, "curved from the centre *h*." There is a similar curved slot in the top plate of the truck frame, which slot is sufficiently long to allow of the lateral movements of the truck, when the locomotive is on a curve of the smallest radius that it ever has to travel over. The curved block might, it is stated, be bolted directly to the under side of the engine, and the curved slot would bring the axles of the wheels parallel with the radial line, or nearly so; but to allow an easier motion to the parts, the block may be prevented from turning by radius bars leading to the centre *h*. The patentee states, however, that he prefers that the radius bar should be attached to the truck frame, so as to cause the truck to swing on the centre *h*, in which case the curved block may be made use of, or the centre-pin be fitted to move in a curved slot. He then describes the arrangement and use of the inclines before mentioned, to check the lateral motion.

It is apparent, that the truck in Bissell's locomotive has no swiveling motion around its centre-pin or king-bolt, that is, around the centre-pin in the centre of the truck which connects the truck with the engine. Bissell

expressly states, that such centre-pin loses its character as a centre of motion, and becomes simply a draft block or pin, and that the centre of motion of the truck, that is, its only centre of motion, is thrown back to the point *h*, outside of the truck. He further says, that, although his truck has a centre-pin, it has "no axis of motion around which it could swing." It has only a motion in the arc of a circle, of which the pin *h*, located between the truck and the driving wheels, is the centre, such motion being a swinging motion of the whole truck across the track. It follows, inevitably, that the position of the pin *h* regulates the position of the axles of the truck relatively to the track, and that the absence of free swiveling in the truck around its centre, prevents the action of the rails on the flanges of the truck wheels from regulating the position of such axles on a curve. When the pin *h* is equidistant between the centre between the axles of the driving wheels and the centre between the axles of the truck wheels, the axles of the truck wheels may on a curve be in their proper position, that is, parallel to a radius of such curve half way between such axles. But that is not true in reference to any other position of the pin *h;* and, even when the pin *h* is in that position, the axles of the truck wheels can never be in such proper position when the engine is entering a curve, or leaving a curve, or changing from a curve in one direction to a curve in another direction, because the position of such axles depends on the position of the pin *h* with reference to the track, and the driving wheels control the position of the pin *h*. A geometrical demonstration shows, that, if the pin *h* be equidistant from the centre between the axles of the drivers and the centre between the axles of the truck wheels, the axles of the drivers and the axles of the truck wheels will, when they are all on the same curve, be in their proper positions; that, if the pin *h* is not thus equidistant, one or the other

set, or both sets, of axles, will, on the same curve, be in a wrong position; that, when the drivers are on a curve, and the truck wheels are on a straight part of the road, the pin *h* can never be in such a position as to allow the axles of the truck wheels and the axles of the drivers, all of them, to be in their proper positions; and that this holds equally true when the truck wheels are on a curve and the drivers are on a straight part of the road, and also when the truck wheels are on one curve and the drivers are on another curve. The action of the drivers, through the pin *h*, is to twist the truck wheels on the track, and control the position of their axles in correspondence with the direction of the longitudinal centre line of the engine.

In the engine of Smith, the truck wheels and the drivers can, at all times, when the engine is on a curve, and when it is leaving a curve, and when it is passing from a curve in one direction to a curve in another direction, take their proper positions respectively, without either being controlled or interfered with by the other. The reason for this is, that the truck in the Smith engine has a swinging motion on its king-bolt, and also admits of the swinging motion across the track, of the engine over the truck, or the truck under the engine. Neither of these motions affects the other. If either motion interfered with the other, the same result would follow as in Bissell's engine, and the position of the drivers would, at times, control the position of the axles of the truck wheels. But, with Smith's arrangement, the track alone controls the position of the axles of the truck wheels, and therefore, they assume their correct position on any track, straight or curved, and on any form of curve, and whether the drivers are on a straight track with the truck wheels, or on the same curve with the truck wheels, or on a straight track while the truck wheels are on a curve, or on a curve while the truck wheels are on a

straight track, or on one curve while the truck wheels are on a different curve. This is a result not attained in Bissell's engine, and it results from the fact that the arrangements and modes of operation of the two structures are different. The truck wheels in Smith's engine are never twisted on the track, and the direction of the longitudinal centre line of the engine does not affect the position of their axles.

It results, from these considerations, that in the engine, as a whole, the Smith arrangement of truck is not merely an equivalent for the Bissell arrangement of truck; because, when the former is substituted for the latter, the resulting structure has a different mode of operation, and produces results which the other structure can not produce. The thing to be looked at is the combined and mutual action of the drivers and the truck wheels, for that was the problem which both Bissell and Smith were trying to solve. Smith's claim is substantially a claim to the combination, with the drivers, of a truck arranged as he describes, allowing of the lateral motion described, and securing the proper position of the drivers on the track, on curves. That combination is not found in Bissell's engine.

It needs no arguement to show, in view of the foregoing considerations, that there was a patentable novelty in the combination which Smith made in his engine, although the truck which he employed existed before, as the Kipple and Bullock truck. The combination produces a new mode of operation, and new results, in the structure as a whole, although the truck, as respects itself, in swiveling and in having a lateral movement, operates in the same way it did in the car which had two of such trucks. It was not apparent, without experiment, that the use of a swinging bolster swiveling truck, in an engine, would relieve all the difficulties attendant on the use of driving wheels on curves. If it had been, Bissell would have

adopted the truck of Bridges and Davenport, instead of resorting to the contrivance he made. Hence, what Smith did was not, as is urged, merely to apply an old contrivance, in an old way, to an analogous use.

It is urged, that Smith's patent is void, granted as it is for an "improvement in trucks for locomotives," because, although he may have invented a combination of the truck with a locomotive, yet he invented no improvement in the truck, but used the truck of Kipple and Bullock; that the invention of such combination is the invention of an improvement in locomotives, or of a new locomotive, or of an improved locomotive, or of a combination of truck and locomotive; and that the patent is void as a patent therefor, because it is not granted as a patent therefor, but is granted as a patent for an "improvement in trucks for locomotives." In this connection, reference is made to the fact, that, in his specification, Smith says, that figure 1 of his drawings is "a plan of my truck;" and, also, that, "in the drawing, I have represented my improved truck itself;" and, also, that "my truck can be fitted in the place of those already constructed." The body of the specification speaks of the invention as an "improvement in trucks for locomotive engines." The statute required that the patent should contain a short description or title of the invention, correctly indicating its nature and design. This patent substantially conforms to the statute. As a truck to be used in a locomotive engine, the truck Smith described as to be employed, is an improvement on Bissell's truck employed in an engine. Smith's invention is an improvement in the use of trucks in locomotive engines, an improvement in the use, for locomotives, of trucks. It is a new and useful improvement; and the class of inventions to which it belongs, the class which embraces its nature and design, is that of trucks for locomotives, trucks used in locomotives. The claim is, to

the employment, in a locomotive, of a truck constructed in a certain way, and producing a certain result in the action of the drivers, on a curve. The title in the patent does not require that the claim should be one to an invention in respect to the truck *per se*. The expression, "my truck," in the specification, has reference, obviously, when the statement of the nature of the invention, and the claim, are considered, to the truck which Smith describes as the one he was intending to use in the engine, to produce the results specified. The patent, therefore, is not open to the objections thus urged.

The answer sets up, that the larger portion of the road of the defendants, and of the operations thereon conducted, is not within the jurisdiction of this court; that all of the engines built by them which are alleged to infringe the Smith patent, were constructed by them at Dunkirk; that the use of said engines is largely confined to the western division of their road; and that such construction and larger use were not, and are not, within the jurisdiction of this court. It is contended, for the defendants, that, as the bill avers, that they "have constructed and built, and caused to be constructed and built, and are now using, trucks for locomotives, constructed in accordance with, and containing and embodying" the invention patented by Smith, and that the plaintiffs "have reason to believe that they will continue to make and use the same," and that the defendants refuse to pay to the plaintiffs any of the profits which they have realized from "such unlawful making and using," and as the bill prays that the defendants may be decreed to pay to the plaintiffs the profits which they have made "by reason of such unlawful manufacture and use," and may be enjoined "from making, constructing, and using trucks for locomotives constructed substantially in accordance with" the patented invention, the bill is based on the making *and* using, in the con-

junctive; that its frame is such, therefore, that, if the plaintiffs can not, under it, recover for the making, they can not for the using; that they can not, in this suit, recover for the making of the only engine proved to have been made or used by them, containing the invention patented, because, although such engine is proved to have been used in this district, it is proved to have been made in the Northern District of this State; that by the sixth section of the act of April 3d, 1818 (3 *U. S. Stat. at Large*, 415), the original jurisdiction of this court is confined to causes arising within this district, and is declared not to extend to causes of action arising within the said Northern Distict; that the cause of action arising out of the making of such engines is, therefore, not within the jurisdiction of this court; and that, as the bill is founded on the making *and* using, there can, consequently, be no recovery whatever under it, on the evidence as to the one engine.

I do not think these views are sound. They overlook the fact, that the bill avers that the defendants refuse "to desist from using" the invention patented; that the grant, in the patent, is of the right "of making, constructing, using, and vending to others to be used; that an infringement may be committed by making or constructing, or using, or vending to others to be used; that an allegation in the bill, of making *or* using, would be bad pleading; and that an allegation of making and using, is proved, to all intents and purposes, by proof of using alone. Indeed, the allegation in the bill, that the defendants have "constructed and built, and are now using, trucks for locomotives constructed in accordance with, and containing and embodying," the patented invention is, by no means, an allegation which necessarily implies that any of the structures which are used by the defendants were built by them, or that any of the structures

which were built by them are used by them. It may as properly be read, that they have constructed infringing structures, and that they are also using infringing structures.

Under this bill, therefore, the plaintiffs, having proved an infringement by the use, in this district, of the engine referred to, are entitled to a decree for an accounting by the defendants in respect of all infringements committed in this district, by making or using, or vending therein, and to an injunction against making in this district, and against using therein, and against vending therein. If the plaintiffs desire to proceed for an account and an injunction in respect of infringements in the Northern District, they must proceed by bill filed there. The defendants are suable in the Circuit Court for that district, their legal existence, under their incorporation by the State of New York, being co-extensive with the territorial limits of that State.

The 1st section of the act of May 4th, 1858 (11 *U. S. Stat. at Large*, 272), which provides, that "all suits not of a local nature, hereafter to be brought in the Circuit and District Courts of the United States, in a district, in any State containing more than one district, against a single defendant, shall be brought in the district in which the defendant resides," has no application to this case. Although this suit is one not of a local nature, that is, is what, if it were a suit at law, would be a transitory action, yet the act has no application to a case where the single defendant resides as fully in all the districts in the State as in any one of them. A corporation, if it can be properly said to "reside" at all, resides in all the districts of the State creating it. It is doubtful whether the act applies to corporations.

A decree will be entered in accordance with the foregoing directions, with costs to the plaintiffs.

110—470

Supreme Court of the United States.

No. 44.

The Pennsylvania Railroad Company, Appellants,

vs.

The Locomotive Engine Safety-Truck Company, Appellees.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania.

S. S. HOLLINGSWORTH,
EDMUND WETMORE,
For Appellees.

Allen, Lane & Scott Printers, 229-231 South Fifth Street, Philadelphia.

Supreme Court of the United States.

The Pennsylvania Railroad Company, Appellants,

vs.

The Locomotive Engine Safety Truck Company, Appellees.

No. 44.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

This is an appeal from the decree of the Circuit Court of the Eastern District of Pennsylvania, deciding that letters patent of the United States, granted Alba F. Smith, February 11th, 1862, numbered 34,377, are valid; that the Pennsylvania Railroad Company has infringed the same; and awarding damages for such infringement.

The main question in the case is the validity of the letters patent. It is not denied that the defendants have infringed them, and the exceptions that were filed to the master's report awarding damages, and overruled by the court, will not need much consideration.

VALIDITY OF SMITH'S LETTERS PATENT.

A brief outline of the state of the art at the time of Smith's invention is necessary before the points, upon

which the appellants rely to show the invalidity of Smith's letters patent, can be intelligently examined.

STATE OF THE ART.

Prior to 1841 trucks free to swivel around their king-bolts, so as to allow a horizontal rotary motion of the truck-frame, independently of the *car* frame or body, under each end of a *car*, were known. [Record, page 111.]

In 1841 Davenport & Bridges obtained letters patent for car trucks, which were not only free to swivel round their king-bolts, but also had a lateral movement under the *car*. And they confined themselves to the method they described of overcoming the difficulties "incident to railway *cars* of the kind known as the long car." The method they described was the use of a swinging bolster or platform, suspended by pendent links from the truck frame, in which bolster or platform the king-bolt connecting the frame of the car to the truck was fitted. [See Record, pages 107–112, and particularly pages 110 and 111.]

In 1857 Levi Bissell obtained letters patent for attaching trucks to locomotives, so as to obtain a lateral movement of the truck under the locomotive. His method was by having a curved slot on the truck frame, in which a similarly curved block either surrounding and attached to the king-bolt, or attached to the bottom of the locomotive, moved. The curved block and the curved slot constituted the arc of a circle of which the centre was a point about midway between the centre of the drivers and the centre of the truck.

The truck moved horizontally in an arc around this point or "axis of motion," and the slot and block which moved in it were kept in the same arc of motion by two radial bars pivoted together at the rear ends at the "axis

of motion," and attached at their forward ends rigidly to either side of the back of the truck. The slot was arranged with inclined planes to resist the lateral motion. [Record, pages 116–120.]

In 1859 Kipple & Bullock obtained letters patent for an improvement on the Davenport & Bridges truck, which consisted in spreading the pendent links at their lower ends, thus utilizing the weight of the front end of the locomotive to resist the tendency of the locomotive (free to move laterally over the truck wheels) to depart from the line of the track.

Smith made his application for letters patent on July 10th, 1861. [Record, page 31.]

In 1851 his attention was first called to the necessity of giving the trucks of all eight-wheel locomotives lateral motion. His first plan was by giving the necessary lateral play through the journal boxes on the axles. In the summer of 1853, while in New York under medical treatment, Smith had frequent conversations with both *Bissell* and *Bridges* in regard to the best plan of constructing engines for running curves.

In 1856 Smith became general superintendent of the Hudson River Railroad, and continuing his experiments in September, 1858, Smith had finished and put upon the Hudson River Railroad his first experimental locomotive with a swiveling truck, from which was suspended by links inclining outward at their lower ends a bolster or platform to which the body of the locomotive was attached by the king-bolt.

This engine was run on the road, but not on fast trains. Smith continued to watch and examine the operation of this engine, and decided upon alterations in the length and divergence of the links, then had a second engine built which was put on the road in July, 1860. Shortly afterwards he had three others made with slight changes, the result of experiment, and then finally settled upon a

construction which suited, and made application for the patent which was granted him. [See Record, pages 15–16 Buchanan, and pages 20–24 Smith.]

In view of this state of the art the appellants make the following assignments of error. They say the court below erred—

First.—In finding that the Smith patent was for a combination of a laterally moving truck with a locomotive engine, and not for a truck *per se*.

Second.—By holding that there was any patentable invention in view of the state of the art in placing a swinging truck beneath a locomotive engine.

Third.—In finding that the alleged invention of Smith was not anticipated in the patent to Bissell.

Fourth.—In finding that the patentee, Smith, had not abandoned his invention to the public and forfeited his right to obtain a patent therefor by its public use for more than two years before his application for a patent therefor.

FIRST.

SMITH'S PATENT IS FOR A COMBINATION OF THE LATERALLY MOVING TRUCK DESCRIBED, WITH A LOCOMOTIVE ENGINE, AND IS NOT FOR THE TRUCK ALONE.

Smith's truck, considered by itself, was not originally invented by him. The Kipple & Bullock truck is essentially the same as Smith's. Kipple & Bullock obtained a patent for their truck on December 20th, 1859. [Record, page 105.] And a substantially similar truck was in

public use in 1852 on the Vermont Central Road and on the Connecticut River Railroad in 1856.

It is true that Smith in his specification describes his invention as "an improvement in trucks for locomotive "engines," and states that "in the drawing I have repre- "sented my improved truck itself;" but this language must be read in connection with the rest of the specification. And when so read, it is at once apparent that when speaking of *his* truck and describing its construction, he is speaking of the truck to be employed in combination with a locomotive engine. He says, "Several "laterally moving trucks have heretofore been made and "applied to railroad cars. My invention does not relate "broadly to such laterally moving trucks, but my said "invention consists in the *employment, in a locomotive* "*engine* of a truck or pilot wheel provided with pendent "links to allow of a lateral movement, so that the driv- "ing wheels of a locomotive engine continue to move "correctly on a curved track, in consequence of the "lateral movement allowed by said pendent links, the "forward part of the engine traveling on a tangent to the "curve, while the axles of the drivers are parallel or "nearly so to the radial link of the curve." [Record, page 30.]

His claim is as follows:—

"I do not claim laterally moving trucks, nor pendent "links separately considered; but what I claim and de- "sire to secure by letters patent, is the *employment in a* "*locomotive engine* of a truck, or pilot wheels, fitted "with pendent links '*o o*' to allow a lateral motion to "the engine, as specified, whereby the drivers of said en- "gine are allowed to remain correctly on the track in "consequence of the lateral motion of the truck allowed "for by said pendent links, when running on a curve, as "set forth."

It is clear, therefore, from an examination of the specification itself, that although the patentee minutely describes the kind of truck he uses in his locomotive, that what he claims as his invention is not the *truck*, but such a truck in combination with a locomotive, so as to allow the drivers of such locomotive, which are rigidly attached to the body of the engine, to remain correctly on the track, on a curve, or upon entering or leaving a curve, in consequence of the lateral motion of the truck under the body of the engine.

SECOND.

THE COMBINATION OF THE TRUCK, WITH THE LOCOMOTIVE IS PATENTABLE.

It is said that this combination is not patentable, because substantially the same truck having the same lateral and the same swiveling motion had been used, and was well known and old, *under each end of a car*. It was urged in argument in the court below, in effect, that Smith's invention was nothing more than blocking the truck at one end of the car, so that it was no longer free either to swing or to swivel, at the same time leaving the truck under the other end, as described by Smith's patent, free both to swivel and to swing, and that this was not invention. Without attempting to draw the line between where invention begins and ordinary mechanical skill ends, we may safely rest on this proposition: *that a combination of elements old in themselves to produce a new and useful result, is always patentable.*

In order to understand whether any new and useful result in a locomotive was attained by Smith's invention it will be necessary, in the first place, to consider the mode of operation of the old locomotive as compared with the operation of the locomotive as improved by

Smith's invention. The old locomotive, like the Smith locomotive, had fixed drivers. The driving wheels were rigidly attached to the body of the locomotive; and they could neither swivel nor swing. The truck was attached to the front end of the locomotive by a king-bolt, around which it was permitted to swivel, but was held by the king-bolt so that no lateral motion under the body of the locomotive was possible. Upon entering a curve with a locomotive of this kind, the body of the engine and the drivers would tend to move on in the line of motion of the locomotive before the curve was reached, in a line tangential to the curve. The truck wheels, of course, followed the curve, and the centre of the front part of the locomotive, being rigidly held by the king-bolt in the centre of the truck (the king-bolt being the centre of the truck), the front end of the locomotive was forcibly pulled around, and, as a necessary consequence, all the drivers were more or less skewed upon the rails, according to the sharpness of the curve, and the inside front driver and the outside back driver were made to grind against the rails, while the outside truck wheels were pressed against the outside rail with all the force arising from the tendency of the locomotive to keep in a line tangential to the curve. If the curve was very sharp the truck wheels were liable to mount the outer rail, and the drivers to run off the track on the inside of the curve.

This difficulty that locomotives had in running around curves is very clearly described in the specification of Mr. Bissell's patent. He says :—

"The ordinary (*a*) * * * locomotive, in running "around a curve, assumes the position shown. The axle "of the driver is not on the line of the radius, in conse-

(*a*) The specification says "*six-wheeled* locomotive," but adds immediately after, that the same is true of locomotives of *eight* or more wheels.

"quence of the same being at right angles to the platform. "The truck carries the forward end of said platform on to "the curved line. Hence, the flanges in contact with the "rail towards the sides '1 1' grind against the rail, and "the flanges on the sides '2 2' are relieved, and there is "a constant, sideways, sliding motion on the rail, and in "consequence, forcing the drivers in a deflective line, or "sideways, from that of a cylindrical, forward, rolling "motion. The truck is constantly by this means borne "to the outer side of the curve, and the engine has a "tendency to go off in the direction of the arrow (out- "side), particularly in case a broken rail or obstruction "occurs, when the truck swivels around on its centre pin, "throwing the locomotive off the track, greatly to the "risk or to the injury of life and limb."

In order to avoid the difficulty arising from the twisting, it was common in the old style of locomotives to have no flanges on the front drivers and an inside rail, so that the drivers being without flanges, when the twisting occurred on a very sharp curve they slid over on to this inside rail.

The same difficulty occurs in passing from a curve into a straight line, and the strain on the locomotive, and the tendency to run off the track with the old style of locomotive, is increased where you pass from one curve to a reverse curve, because you not only have the strain (already described) caused by passing from the curve into a straight line, but you have also the additional strain on the drivers caused by passing *instantly* from a straight line into a curve.

On the other hand, with the Smith improvement, on entering a curve the truck wheels, as before, follow the line of the curve, but being free to move laterally under the front end of the locomotive, the body of the locomotive is allowed, to the extent of this lateral movement,

to retain its natural position, in a line tangential to the curve, and in this way the skewing of the drivers and the pressure on the outside rail by the truck wheels and the inside rail by the front driving wheel is obviated.

[See evidence of Henry Waters, defendant's expert, Record, page 86, Ans. to Int. 4; also evidence of Renwick, complainant's expert, Record, pages 11 and 12.]

Both experts agree in this advantage of a *laterally moving truck* over the old rigid truck.

Thus, by the use of the old swinging truck in a locomotive engine, we have obtained a new and useful result which was impossible in the old style of engine, which had no swinging truck. We have not, therefore, a mere bare, naked, double-user of an old device, but have combined a known device with a locomotive to produce a useful result never before attained.

And this result, viz., of keeping the axles of the wheels radial to the line of curvature, is one which was attained in the case of railway cars *before* their trucks were made to have any lateral motion. It was accomplished by the *swiveling* on the king-bolt alone at *each* end of the car. The function of the swing truck in the locomotive is *different* from its function on a car, because there can be no *swiveling* of the drivers.

The object of the Bridges & Davenport car truck (and the Kipple & Bullock improvement on that invention) and its operation was *not* to aid the truck-wheels in getting around a curve. As long as *both* trucks were free to swivel they necessarily conformed to the position of least resistance, and were consequently controlled in their position by the track, and this is undoubtedly the best plan for passing a curve. The swing motion was added merely to avoid the sudden shocks and jolts on striking a curve or inequality on a tangent. There is not a word in either Davenport & Bridges or Kipple & Bullock about any advantage in getting round curves so far as the *position* of the *car* wheels is concerned.

Davenport & Bridges say: "Be it known that we, the "said Charles Davenport and Albert Bridges, have in- "vented a new and useful improvement in railroad car- "riages, by which the inconvenience to passengers arising "from the sudden lateral motion of the wheels is obvi- "ated; and that the following is a full and exact descrip- "tion of the same, reference being had to the accompa- "nying drawings, which, taken in connection herewith, "form our specification setting forth the principles of "construction of our improvement (by which it may be "distinguished from others of a like character), and "such parts or combinations as we claim to be our "invention, and for which we desire an exclusive privi- "lege for fourteen years, to be secured to us by letters "patent. Most persons who travel by railroad experi- "ence a continual repetition of sudden jars or shocks, "arising from the *sideway movement* of the flanches of "the wheels of the car against the rails of the track. "And so extensive are the evils of these frequent shocks "that, besides being greatly to the discomfort of the "passengers, preventing them almost entirely from read- "ing while traveling in this manner, it is highly injuri- "ous to the carriages, causing the joints and other parts "to become loose and soon deranged. The object of "our improvements is to *obviate the effects of the above* "*lateral motion* by springs suitably arranged, and which "we now proceed to explain." And in their claim, after stating their combination, they add: "The whole being "for the purpose of preventing the injurious and unpleas- "ant effects resulting to the car and passengers or goods "therein from the *sideway movement* of the flanches of "the wheels against the rails of the track, as herein- "before set forth." [Record, pages 64 and 67.]

Kipple & Bullock merely speak of the fact that their truck imparts "to the car an *easy* lateral movement as it "passes over curves and uneven portions of the track." [Record, page 69.]

In a locomotive it is impossible for the drivers to either swing or swivel, and the object of the Smith invention is to reach as near as possible to the condition in which the locomotive would be, could both truck-wheels and drivers swivel.

And it accomplishes this object by allowing the *truck* to follow the *track* by swiveling, and at the same time moving laterally under the body of the locomotive, while the driving wheels are kept nearly in their proper position (*i. e.*, as if free to *swivel*) by *not* being *twisted* across the rails by the truck, and by being gradually brought into the curve by the resistance of gravity to the outward swing.

The *sole* function of the swing truck in *cars* is entirely *secondary* in a locomotive, where instead of causing the locomotive to yield easily to side pushes (from irregularities in the track), it has all the tendency of the locomotive to move in a straight line to overcome, whenever a curve is reached, before it is in its *normal* condition for resisting side jolts.

It is plain, then, that not only is a new result obtained by the combination of a swinging and swiveling truck in a locomotive, but this result is something entirely different from the operation of the trucks of the same kind under a car.

Defendant's expert Waters agrees to this view. He says, "From the foregoing I think it is obvious that "there is nothing new in the machine described in "Smith's patent, as far as regards the truck itself in its "mode of operation. But there is another question in-"volved, viz: Is the locomotive of Smith new?

"Now, as compared with the common eight-wheeled "car fitted with the improvements of Kipple & Bullock, "I am inclined to think it is new, because the mode of "operation of the whole thing together, considered as a "unit, is different from the operation of an eight-wheeled "car, as a unit." [Record, page 60.]

And, in this connection, it is worthy of consideration that, notwithstanding the fact that although Bridges' truck, which contains substantially all that is contained in the Smith, or Kipple & Bullock truck, was patented in 1841, and went into extensive use under eight-wheeled cars, yet no one, until Smith commenced his experiments on the subject, ever had conceived the idea of the application of this truck under a locomotive.

As early as 1853, Smith had in his mind the conception of his invention, and discussed the question as to the proper mode of constructing engines both with Bridges and with Bissell, and though Bissell himself, in 1857, patented his invention, the possibility of accomplishing the result in the way in which Smith subsequently made his combination did not occur to him; and though Smith had the conception in his mind as early as 1853, and commenced to experiment as early as 1857 or 1858, and it was not until 1860 that he finally settled upon the combination for which he applied for letters patent in 1861.

The appellants have advanced an argument, more remarkable for ingenuity than soundness, to show that the invention of Smith is not an improvement but "a *serious* "*and harmful mistake* which has cost the appellants many "thousand dollars," and that therefore the combination of the truck with the locomotive is not patentable. [See pages 15, 16, and 17 of Appellant's Brief.]

This argument, as such, needs no refutation, but the references to the Master's report, the citation from the opinion of Mr. Justice Strong, and the extract from the evidence of Mr. Parry (which is said to "sum up the whole "matter") are so UNIFORMLY *incorrect* that it is proper to call the attention of the court to the TRUTH.

I cite from pages 16 and 17 of the Brief of Appellants.

"But it has been shown that the use of a swing truck

"with a locomotive is not an improvement on the use of "a fixed truck, but on the contrary, it is a very serious "and harmful mistake which has cost this appellant "many thousands of dollars (see Master's report and "Mr. Justice Strong's opinion, page 589, where he uses "the language following :—

"*There is no gain, profit, or advantage in the use of one "over the use of the other.*")

"Mr. Parry, one of the partners in the Baldwin Loco- "motive Works (perhaps the largest builders in the "world), sums up the whole matter very briefly on page "422.

"×Q. 25.—A. * * *I at one time thought it "(the swing truck) was an improvement like most other peo- "ple. 'Run in fashions, run in ruts,' they say.*

×Q. 26. *When was it changed?*

"A. *It was changed a good many years ago. I have "always regarded it as a means of helping to remedy a "wrong by making another wrong; that is, one wrong to "help another wrong to get it nearer right.*

"× Q. 27. DO YOU CONSIDER IT AN IMPROVEMENT OR "NOT?

"A. NOT AT ALL.

"×Q. 28. AN ENGINE EQUIPPED WITH A SWING-BOL- "STER TRUCK IS LESS PERFECT AS A MACHINE THAN ONE "WITHOUT A SWING-BOLSTER TRUCK?

"A. I THINK SO.

"An overwhelming preponderance of the witnesses ex- "amined agree with Mr. Parry in their estimate of the "utility of the swing-truck, and the opinion is made a "certainty by the experiments tried and exhibits put "in evidence. This subject is, however, so thoroughly "dealt with by the Master in his report, which contains

"references to the testimony, that it is unnecessary to go "more into details here."

These inaccuracies in the brief of appellants are easily corrected.

I. *The Master's Report.*

The Master, in fixing a basis of comparison for the estimation of profits, took an engine with a fixed truck and blind front drivers, and his conclusion was that such an engine is "as convenient, economical, and ser- "viceable for the traction of trains on tangents and "curves as an engine furnished with a swing-truck and "any kind of driving-wheels in use." [Record, page 144.]

On page 590 of the Record Mr. Justice Strong does use the words attributed to him, viz.:—

"There is no gain, profit, or advantage in the use of "one over the other;" but he, too, uses them in reference to the comparative merits of an engine with a rigid truck and *blind front drivers* and an engine with a swing-truck.

The sentence immediately preceding is as follows:— "The evidence certainly establishes that a locomotive "with plain forward driving wheels, that is, with forward "driving wheels without flanges and with a rigid truck, "is, in all respects, quite as convenient and economical "as is a locomotive with such a truck as the patents de- "scribe," [Record, page 590,] and then follows the sentence quoted by the appellants: "There is no gain, "profit, or advantage in the use of one over the use of "the other."

The comparison in both cases is between a *swing*-truck on a locomotive with *all* its drivers flanged and a *rigid*

truck on a locomotive having its front drivers *without flanges.*

The latter kind of locomotive may or may not be a better machine than the former; but neither the Master nor Mr. Justice Strong say that in the use of an engine with *all* its drivers flanged and equipped with a *swing*-truck, there is "no gain, profit, or advantage" over the *same* engine equipped with a *rigid* truck, and this is kind of engine the defendants used.

Mr. Parr, testified as he is quoted, but the quotation stops too soon. The next question and answer were as follows:—

×Q. 29. "Can you tell me about when you changed "your mind?

A. "Well, as I remarked, I always believed that a "plain tire on the front wheels of the drivers was a per- "fect engine. Then, in course of time, parties endeavored "to use two pair of drivers flanged, which made an en- "gine that was not free on the rail, that was not an "improvement, that was a detriment to the engine. Then "in order to maintain that detriment there was another "put on in itself about as bad (the swing truck); *but the "two together made the engine passable.* Therefore I "never had the opinion that the swing bolster truck with "double flanges was a perfect engine." [Record, page 422.]

Hill, a witness called by defendants, says, that a fixed centre truck will do as well, yet he is a little in favor of the Hudson improvement with radial bars. [Record, page 275.]

The Hudson improvement is the Bissell truck with a slot, in which the centre pin joining the two ends of the

radial bars can move, and thus make up for the lack of swivel in the king-bolt.

J. B. Collin, the mechanical engineer of the defendants' railroad, says, that while the Smith truck is of no benefit when the radius of curvature is over three hundred and fifty feet, yet with a radius of three hundred and fifty feet it would be a benefit. [Record, page 580, answer to cross-question 25.] And on the preceding page he mentions a curve on the Tyrone and Clearfield branch of defendants' road with a radius of *three hundred and thirty-one* feet.

The conduct of the defendants themselves affords the most conclusive evidence on this subject.

After the injunction was granted in this cause, the defendants moved to have it suspended, and upon the ground that it would be *dangerous* to discontinue the use of the swing truck, obtained an order suspending the injunction upon entering security in the sum of $40,000, which they did, and continued to use the Smith truck.

On March 9th, 1877, the evidence is that the defendants gave an order for the discontinuance of the swing truck as fast as the engines should be sent into the shop for repairs. [Record, page 586.]

On November 14th, 1877, out of seventy-eight engines with the swing truck on the Middle Division of the defendants' road, NINE only had been changed to rigid trucks, *nine* in *eight* months out of seventy-eight.

So much for want of utility in the Smith locomotive. It may be added that four thousand of the swing-truck engines had gone into actual use up to 1874. [Record, page 25.]

THIRD.

SMITH'S COMBINATION OF A TRUCK FREE TO SWING LATERALLY AND AT THE SAME TIME TO SWIVEL ON ITS KING-BOLT IS A DIFFERENT DEVICE FROM BISSELL'S COMBINATION OF HIS TRUCK WITH A LOCOMOTIVE, BECAUSE BISSELL'S TRUCK WAS NOT FREE EITHER TO SWIVEL ON ITS KING-BOLT OR MOVE LATERALLY UNDER THE BODY OF THE LOCOMOTIVE.

It will be necessary to examine Bissell's specification somewhat closely, in order to understand precisely what his combination was. The Bissell patent allows of a limited lateral motion of the truck beneath the front end of the locomotive; but, this lateral motion, while generally transverse, is really rotary around a centre midway, or slightly in front of a point midway between lines drawn between and at right angles to the axles of the drivers and the axles of the truck wheels; and the motion of the truck is in the arc of a circle of which this point midway, or nearly midway, between the drivers and the truck, is the centre. He uses, instead of the swinging bolster and links, a curved block sliding in a curved slot on the top of the truck frame, and the tendency to too great lateral motion was controlled by inclined planes fitting in the bottom of the slot, on which blocks fitted to the cross-bar surrounding the centre-pin moved. When the engine is on a straight line these blocks are on the lowest point of the inclined plane, and when the engine enters a curve, and the lateral motion begins, these blocks have to move up the incline, and, of course, the resistance to this motion by the inclines limits what would otherwise be the extent of the lateral swing. [Record, pages 112, 116.]

While this combination of Bissell's allows of a restricted lateral motion of the truck around a centre of motion outside of the truck somewhere between the axles of the drivers and the truck, it is described as being intended *to avoid allowing any swiveling motion around the king-bolt.* He says the object of his invention was:—

"To retain the truck with the axles always at right "angles to the rail, whether on a straight or on a curved "track, and prevent the truck swinging around on its "centre-pin in case of meeting any obstruction." [Record, page 112.]

Again, he says:—

"I construct my truck in such a manner that the axles "of the driving wheels shall be on the line of, or parallel "to, the radial line of the curve, so as always to have a "direct, forward, propelling motion, and not strain or "wear the rails or flanges of the wheels, so that two or "more pairs of the drivers can be fitted with flanges.

"The centre line of the locomotive, in going around "the curve, travels as a tangent to the centre of the "drivers.

"And to accommodate the curve I fit the truck, or for- "ward wheels, in such a manner as to allow of a trans- "verse motion, the said truck swinging laterally upon an "axis of motion 'h,' located centrally between the cen- "tre of the drivers and the truck (or slightly forward of "the same, so as to give *a slight tendency to the truck to "run to the inner side of the curved track*); thereby, the "axles of the truck wheels are parallel, or nearly so, to "the radial line of the curved rail, and the engine runs "around any given curve without much more strain, "either on the wheels or the track, than would occur on "a straight railroad, and, at the same time, *there is no "chance for the truck to turn on this centre-pin* by any ob- "struction coming in contact with the wheels; and the

"wheels will pass over a broken rail and not be displaced,
"unless all four wheels are all simultaneously unsupported,
"and even then the wheels and truck being correctly set
"to the angular position with the drivers and curvature
"of the track will continue to move in the correct direc-
"tion, and pass over any obstacle and broken rail, and
"maintain the uninjured part of the track." [Record, page 113.]

He points out that one of the dangers to be avoided is:—

"When the truck *swivels around on its centre-pin*,
"throwing the locomotive off the track, greatly to the
"injury of life and limb." [Record, page 113.]

Again he says:—

"In running on either a straight or a curved track,
"one of the truck wheels often breaks off, and the truck
"swivels around on its centre-pin, and, in consequence,
"throws the engine off the track; but with my device
"one wheel or even the two wheels on the opposite sides
"diagonally of the truck might break off, and still the
"truck would not run off the track, because *its position,*
"*relatively to the body of the locomotive, is firmly main-*
"*tained.*" [Record, page 114.]

Again, in speaking of the centre-pin, he says:—

"Which, in my arrangement, changes its character
"from a centre of motion simply to that of a draft-block
"or pin." [Record, page 114.]

He also says that the block "K" may be bolted directly to the under side of the engine. [Record, page 114.]

These extracts, taken from Bissell's specification, show very clearly that whatever else he had in his mind, he had this idea distinctly, that there was to be no swiveling motion about the king-bolt; that any motion of the truck which was to take place in his combination was a motion around a point placed at the centre or near the centre of

a line drawn from the middle of the truck frame to a point midway between the axles of the drivers. It is apparent that any swiveling motion around the king-bolt would be impossible in the Bissell truck, because the truck being rigidly attached to the extremity of the two bars extending to a point behind the trucks where they are both pivoted at their other ends, and around which the truck moves as a centre of motion, it would be impossible for this truck, thus rigidly attached to the end of these radius bars, to have also a swiveling or rotating motion around the king-bolt, without at once breaking one or both of the bars.

In the Bissell locomotive, therefore, the combination differs mechanically from the combination in the Smith locomotive, which allows a free swiveling motion to the king-bolt.

The appellants have put forward the argument, not before advanced in this case, that the second claim of the Bissell covers *broadly the combination of a locomotive engine with a laterally moving truck.*

The answer to the position is plain :—

1. Bissell, after excluding certain modes of attaching trucks to locomotives, says:—"But in my case, the truck "having four or more wheels, acts as a lever to bring the "body of the engine into the correct position with the "track, because the flanges of the two or more pairs of "truck wheels coming into the straight or curved line "relative with the driver or drivers, can not do so with- "out the centre 'h' being in the correct position relatively "with said wheels and insuring the correct position of "the body relatively with the wheels." [Record, page 115.]

This description shows conclusively that the only mode of attachment Bissell had in his mind was at the centre 'h' which is a centre of motion outside of the truck. Again, the second claim is for a combination of inclined

planes or their equivalents in a truck having a lateral motion under the locomotive engine, "THE WHOLE *constructed and acting substantially as and for the purposes specified*," that is to say, rotating about a centre 'h' between the truck and drivers. And the reason for the second claim was that the first claim omitted any reference to inclined planes or their equivalents, which are necessary to restore the truck to its normal position.

The appellants say (see their brief, page 24) that both Smith & Bissell connect their trucks to the engine in the same way and in the same place. This is not correct. Smith's king-bolt fits in a bolster free to swing laterally. Bissell, when he uses a king-bolt, uses it as a substitute for a curved block sliding in a curved slot, which is the arc of a circle whose centre is 'h,' a point outside of this truck.

The appellants say that Smith & Bissell describe the result of their combination in the same way (their brief, page 25). In the *material* point of difference between them, *i. e.*, their operation in entering upon and leaving a curve, while Smith's patent explains the advantage of his combination [Record, page 30], Bissell says nothing.

The appellants seek to enforce their new contention that Bissell made two inventions, one of which was the combination in a locomotive of *any* laterally moving truck by endeavoring to analyze his specification so as to show that radius bars were not essential to the operation of Bissell's truck.

Even if the radial bars were removed Bissell's truck could not swivel on its king-bolt (if it should have one), because the truck in Bissell's combination slides across the king-bolt in a curved slot which forms the arc of a

circle, whose centre is the point 'h,' outside of the truck. [Record, page 114.]

On page 33 of brief of appellants it is stated that—

"*The radial bars were thought by railroad men a more valuable device than the lateral moving truck without them.*"

And appellee's witness Heden is quoted. The appellants again have forgotten to give the qualification of what they quote contained in the next preceding answer of the same witness, who says in answer 33 [Record, page 163]:—

"I refer to all those" (*i. e.* trucks) "built and furnished "this line after the adoption of the LOOSE radius bar— "more particularly after that than before * * * "but the difference in truck boxes is considerable be- "tween the *fixed* and the *loose* radius bars."

Another inaccuracy of the appellants may be here noted. On page 45 of their brief they say that not one of *appellees'* witnesses pretends that the use or non-use of radial bars makes any difference in the motion of the truck, and cites the names of several witnesses and refers to their testimony in the Record by page. Not one of these witnesses says anything *pro* or *con* on the subject, nor was one of them talking about the matter. While it is true they did not pretend to say anything, the inference *insinuated,* that they believed there was no difference, is without foundation.

On page 47 it is asserted that the radius bars were extensively and successfully used. The only use spoken of is by Heden, and that was with a *loose* radius bar. The loose radius bar, it may be stated [though not in the record], was the Hudson improvement of 1864, in which

the ends of the two radius bars moved in a slot about the point 'h,' thus compensating for the liability of the truck to swivel on *its own centre.*

To return now to a comparison of the Bissell and Smith combinations. There is not only the difference in the mechanical construction already explained, but there is a difference in the results which flow from this difference in structure. As I have shown already, in the Smith locomotive, either on a curve or in entering or leaving a curve, and particularly on leaving one curve and entering a reverse curve, by the operation of the Smith combination, which allows the trucks freedom of swiveling, so that their position is entirely controlled by the track, and which, at the same time, allows the drivers by a lateral motion of the truck under the front end of the engine to maintain the position of their flanges tangential to the line of the curvature, the locomotive is, as a whole, both as to its driving wheels and its truck wheels maintained and preserved in the correct and best position in which it can be placed to avoid friction and insure safety. The same results do not follow with the Bissell truck; and just here it may be well to note that while the Smith truck has come into very general and practical use on the defendants' road, the Bissell truck does not appear to have been practically used to any considerable extent.

The Bissell combination is successful in securing a correct position for the driving and truck wheels on the track only when a locomotive is either on a straight line, or on a curve of a uniform radius. Either on entering a curve from a straight line, or leaving a curve from a straight line, or passing from a curve into a reverse curve, this combination, or device, does not leave the axles of the drivers in a line radial to the curve, nor does it leave the truck wheels free to take a position controlled en-

tirely by the track. It can be shown, mathematically, that in the Bissell locomotive, when the flanges of the driving wheels are tangential to the curve and the truck wheels also tangential to the same curve, these tangents produced will meet and be equal in length, and that therefore the point of meeting must be midway between the centre line of the driving axles and the centre line of the truck wheels. These tangents only can be equal where they are the tangents of the same curve. Consequently, on entering a curve, or leaving a curve, where a tangent drawn through the flanges of the drivers will not be a tangent of the same curve as a tangent drawn through the flanges of the truck wheels, the point of meeting of these two tangents produced will not be a centre point between the driving axles and the truck wheels. Where the truck wheels are passing into a reverse curve, while the drivers are on a curve, a tangent to the line of curve on which the drivers rest will not meet a tangent to the line of the curve in which the truck wheels are, and, consequently, there is no point at all between the drivers and the truck around which the truck can rotate, and yet maintain its position tangential to the curve.

This is, in effect, admitted by the defendants' expert, William C. Hibbard, who says, on cross-examination :—

"The radius bars are not adapted to the condition of the machine when partly upon a curve and partly upon a straight line; but to the condition of the machine either entirely on a straight line or upon a curve."

So that Bissell's device, in reality, only met part of the difficulty which was to be overcome. It was only applicable to certain conditions, when the locomotive was either upon a straight line or upon a curve; but in passing from a straight line to a curve, or from a curve to a straight line, it was devised so that the results which he sought to reach were impossible to be reached, without a change in the position of the point around which his truck rotated, which change, if it were made to meet

the exigency of passing in or out of a curve, would leave it in an improper place when on a uniform curve or a straight line.

FOURTH.

THERE WAS NO SUCH PUBLIC USE OF SMITH'S INVENTION AS AMOUNTED TO AN ABANDONMENT TO THE PUBLIC.

This assignment of error is not noticed in the brief of ths appellants and is, I presume, *abandoned.*

The facts are briefly as follows :—

The only public use by Smith more than two years before the date of his application for a patent that is shown, is the use of the first locomotive that was built on the Hudson River Railroad in 1858, but both Smith and Buchanan testify that this was an experimental engine, and from the results of that experiment they made changes before Smith finally settled upon the form for which he ultimately applied for letters patent, and it must be borne in mind that from the nature of the machine an experimental use had to be made in public. A locomotive can not be run in a room, and if you make an experiment with it at all, you must experiment with it in public. But that is not certainly such an abandonment to the public as is contemplated by the patent act. (Elizabeth *vs.* Nicholson Pavement Company, 97 U. S., 126.) The only other public use that is testified to is a public use on the Old Colony Railroad, just a little more, a few months more, than the two years prior to Smith's application, and it is not shown that Smith had any knowledge of it, or much less, that he ever consented to it, so that such use can not be a public use for more than two years prior to his application, with his knowledge and consent.

FIFTH.

THE APPELLEES HAVE ESTABLISHED A LICENSE FEE OF ONE HUNDRED DOLLARS FOR EACH ENGINE EMBODYING THE SMITH INVENTION.

The evidence on this subject is as follows:—

Miller F. Moore, the secretary of the company complainant, testifies (page 25 Record) in substance: That in 1874 [the time when he was speaking] there were four thousand locomotives with the Smith truck; that there were sixteen locomotive builders in the United States, of which twelve had taken licenses under the Smith patent, and of these twelve, eleven had refused to continue paying since the defense set up in this suit. That from two hundred to three hundred engines are produced annually using the Smith patent, and that in Erie Railway suit he settled at about seventy-five dollars per engine.

The same witness says again (Record, 178):—

"Q. 6. You have collected a large number of royalties "upon this patent, have you not?

"A. Yes, sir.

"Q. 7. What royalties have you collected—what is "the amount? I do not mean the aggregate, but the "amount per engine.

"A. Licenses are made at the rate of one hundred dol- "lars per engine; and to railroad companies our prices "are invariably one hundred dollars. I know of no "single exception. But as we considered it to be judi- "cious management in the introduction of this improve- "ment, we have interested the locomotive builders in "our behalf, not only as an interest to them, but as an "assistance to us. We give them a discount of twenty- "five per cent. from our usual royalty for the purpose of "introducing our invention to the railroad community, "and to assist us in collecting our royalties. They

"build these locomotives for the different railroad cor-
"porations in the country, and send them to all parts of
"the Union, and out of the country; and it would be a
"difficult and expensive matter for us to hold the railroads
"accountable for the royalty on the engines manufac-
"tured. In many cases it would cost us more than the
"royalty due to collect the royalty of one hundred dol-
"lars per engine; and so we arrange with the engine
"builders to settle with us according to the collections
"they make, less twenty-five per cent."

And on cross-examination he says that the settlement of the Erie Railway suit was at between seventy-four dollars and seventy-five dollars per engine. Again he says (Record, pages 204, 205, and 206):—

"Miller F. Moore, a witness recalled by the complain-
"ant, testifies as follows:—

"By MR. HOLLINGSWORTH:

"Q. 1. About how many locomotives with the swing
"truck have the complainants' company sold?

"A. Do you want those embraced in the settlement
"with the Western Railroad Association?

"Q. 2. You can name those, and then give the num-
"ber other than those.

"A. There were somewheres in the neighborhood of
"twenty-three hundred in all. There were about eight
"hundred in the Western Railroad Association.

"Q. 3. About how much royalty did you receive for
"those sold to the Western Railroad Association, and
"what were the circumstances connected with the re-
"ceipt of that royalty?

"A. In the settlement with the Western Railroad As-
"sociation they made a proposition to give us thirty dol-
"lars an engine for all they had at the time the proposition
"was made, and to give us fifty dollars for each addi-
"tional engine they should thereafter put in use. That
"was the proposition of the Western Railroad Associa-
"tion, and our people thought that was a settlement

"which it would be pretty advantageous to make, as it "involved a settlement with about twenty-five of the "principal roads in the West, any one of which was in "condition and position to defend any suit we might "bring against them, and they making this proposition "to us we thought it advisable to accept.

"Q. 4. Leaving those settled for with the Western "Railroad Association out of the case, you have sold "about how many other engines?

"A. We have sold about fifteen hundred.

"Q. 5. About what average price have you received "for them?

"A. We have received about seventy dollars and a "fraction over, between seventy and seventy-one dollars "apiece; between seventy and seventy-one dollars.

"Q. 6. What are you charging manufacturers for "those engines now?

"A. Since the depression of business came on we have "reduced our royalty from seventy-five dollars to fifty "dollars an engine.

"Q. 7. How much had you been charging before that "time?

"A. Seventy-five dollars.

"Q. 8. What do you charge railroad companies?

"A. We charged railroad companies one hundred "dollars. Seventy-five dollars to railroad builders was "the net of one hundred dollars less twenty-five per cent. "commission which we gave to locomotive builders in "order that they might assume the payment of the royalty. "The plan previously had been that when locomotive "builders had built locomotives for the railroads we "assumed the collection of the royalty; but it necessi- "tated a great deal of expense and time, as the engines "went all over the country, and we thought it would be "economy on the part of our management to allow the "locomotive builders a discount of twenty-five per cent. "and collect our royalty from them, and they make re-

"ports to us monthly, or quarterly, or semi-annually, as "it was most convenient for them to do.

"Q. 9. You say the average price for your fifteen "hundred locomotives was only seventy dollars and a "fraction, when you charged at that time, until the de- "pression in business, seventy-five dollars to builders, "and one hundred dollars to companies; explain how it "was, therefore, that your fifteen hundred locomotives "only netted you seventy dollars and a fraction?

"A. That was in consequence of two reasons, one of "which was that previous to the organization of the Lo- "comotive Engine Safety Truck Company some of these "patents were owned by Levi Bissell and others, and they "had entered into a contract with the Rogers Locomotive "Works, giving them the right to manufacture and use the "improvements for fifty-five dollars an engine, and when "the company was organized, it assumed this contract "that was made by Bissell and others, and carried it out. "The Rogers Locomotive Works have constructed "a very large proportion of engines with the swing "truck, and they have paid our people somewhere about "$34,000. That embraces a very large proportion of "the whole amount of our business, and then when the lo- "comotive builders began to build what is now termed the "narrow-gauge engines, that is, of a gauge less than four "feet eight and a half inches, the price for those engines "was only about two-thirds what it was for a full-gauge "engine, and the locomotive builders thought it was a "hardship to pay the same royalty on those narrow- "gauge engines which they did on the full-gauge en- "gine, and to meet their views we reduced the royalty "on the narrow-gauge engine to fifty dollars, not wishing "to have anybody think that it was a hardship to use "this patent. There have been a great many of those "narrow-gauge engines built; how many I do not know, "because I never kept any account of this class sepa- "rately."

Take this evidence all together and it amounts to this, that the price charged as a license fee to railroad companies was always one hundred dollars for the class of engines on which the appellants have used the invention.

When suits were *compromised*, *not* brought to the court of last resort, less was taken, and where sales were made through locomotive builders, they were allowed a commission of 25 per cent.

It proves, moreover, that prior to April, 1874, *twelve* out of *sixteen* locomotive builders had taken a license from the company complainant, and that *eleven* of these *twelve* had refused to pay in consequence of the refusal of the defendants to pay anything. [Record, page 24.]

It shows that out of two hundred and thirteen engines on the Erie Railroad the license fee on one hundred and fifty-nine had been paid by locomotive builders.

It shows further that the company complainant had *received* up to September, 1876, on fifteen hundred locomotives an average price of between seventy dollars and seventy-one dollars apiece. [Record, page 205.] Of this amount about $34,000 had been received from the Rogers Locomotive Company, at the rate of fifty-five dollars per engine, under an old contract. Fifteen hundred engines at seventy dollars and fifty cents makes the total amount received $105,750; deduct from this amount $34,000, and it leaves $71,750.

Fifty-five dollars, the price of one engine, multiplied by six hundred and eighteen makes $34,000, the amount paid the Rogers Locomotive Company. Deduct this number of engines, six hundred and eighteen, from fifteen hundred, and we have eight hundred and eighty-two engines, for which the complainants received $71,750, or an average license fee per engine of eighty-one dollars and a fraction. Many of these license fees were collected through locomotive builders who only paid seventy-five dollars on the ordinary guage and fifty dollars on the

narrow guage roads. [Record, page 206.] So that on many locomotives there was received a license fee of much over eighty dollars. The witness Moore is there shown to be corroborated by the figures. He is also corroborated by the witness Blackall, superintendent of machinery on the Delaware and Hudson Railroad.

His evidence is on page 187 of Record. It is as follows:—

"Q. What royalty has your company paid on those "swing-truck engines?

"A. We have paid on what we put on ourselves $100; "but the locomotives we have, made by Danforth & Cooke, "and Dickson Manufacturing Company, they paid for. "What they paid I don't know."

On page 186, Record, the same witness says that they had seventy-four swing-truck engines on their road out of one hundred and four engines, and had sold four (4) swing-truck engines.

This is all the evidence in the case.

It establishes beyond contradiction the license fee to manufacturers at seventy-five dollars. And while it does not specify the number of engines sold to railroad companies, it is clear that whatever the number was the license fee was always $100.

It is said, however, that inasmuch as the license covered six (6) inventions (one of which itself sold at fifty-five dollars per engine) the fee must be divided by six. If all the inventions could be used *at the same time* on *one* locomotive this would be reasonable.

But physically this is impossible, and contractually the license being in the alternative, it would be unlawful. The Bissell truck and the Smith can not be used together on the same locomotive, nor can the Hudson inventions, one of which is an improvement on the Bissell, and the other only applicable to engines to which the Smith invention is not applicable.

The rule which apportions the license fee, has no application at any time when, as in the present case, the license only authorizes the use of *one* of the *several* patents which it includes.

SIXTH.

THE ALLOWANCE OF INTEREST ON THE DAMAGES IS PROPER.

The amount of the damages was liquidated prior to the time the defendants began to infringe.

In cases of trover, replevin, trespass interest on the value of the property is assessed by way of damages.

Parrott *vs.* Ice Co., 46 N. Y., 361;

Sedgwick on Damages, (sixth ed.), *page 491;

Andrews *vs.* Durant, 18 N. Y., 496.

In Alden's Appeal, 93 Pa. St., 182, on a bill for an account of ore taken in excess of an ore right, interest was allowed on the amount the ore sold for.

In conclusion we ask the affirmance of the decree.

EDMUND WETMORE,
S. S. HOLLINGSWORTH,
For Appellees.